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Telephones in Industrial Establishments.

A few weeks ago, at a meeting of the Institution of Mechanical Engineers, some of the British engineers who visited American shops last summer said very nice things about the places they inspected. It is gratifying to know that American systems of shop organization are so good as to deeply impress competent critics from abroad. We have thought they were pretty good ourselves, but it is nice to be told so by men traditionally fault-finding. It is idle to deny that there are some defects in the average organization, however, such as a general lack of means of quick communication between the minor parts of a plant. This is particularly strange in view of the extensive use of telephones in American commercial houses and private homes.

In the average industrial establishment there is a telephone connecting the superintendent's room with the main office, and that is all. If the superintendent wishes to talk with any foreman he must send a messenger for him or personally go after him. One or both men lose a quarter of an hour at least over a matter that could be settled over a telephone in a couple of minutes. If the foreman of one department desires to talk over something with another foreman he has to hunt him up, thus losing time needlessly. The aim of shop managers is to keep the foremen constantly in their departments, but if they have to go about the works hunting for other men every time they require information not in their possession, the system is weakened. The employment of messenger boys to secure tools and supplies for machinists, which is a feature of some shops, is in no sense a substitute for the telephone for the foreman, although many shop owners seem to think that it is.

As a matter of fact, the push-button-and-messenger system of communication between the different parts of an office has a strong demoralizing effect in addition to being expensive and incomplete. A battery of push buttons is generally accompanied by a bundle of rubber stamps, a number of partly idle, cheap assistants to answer the calls, and the other indications of inefficiency. Where messengers are employed instead of telephones, there is a tendency to accumulate too many boys, and any young fellow who is sufficiently dry behind the ears to be advanced to a desk position immediately acquires the belief that his work is to be done by these slaves of the push-button. Pay rolls are padded unnecessarily by low-price help; expensive assistants are never engaged until their necessity is manifest, but a few more boys about an establishment attract little attention. The presence of these idle boys is not a great expense, although it is greater than the cost of a telephone system, but their effect on the staff a little higher up on the salary list is decidedly bad. The tendency of the times is to make machinery do the work of persons, and the utility of the telephone in eliminating cheap labor in this way is overlooked to a surprising degree, even in works where skilled labor has been reduced to a minimum by the introduction of labor-saving equipment.

Good Roads in Illinois.

There seems to be an even chance that the construction of good roads will be undertaken in Illinois by State officials. Nearly two years ago the legislature authorized the appointment of a commission to investigate the good road problem and related topics; and this commission, of which Chief Engineer H. U. Wallace, of the Illinois Central R. R., was a member, spent considerably more than a year on this work. The conditions, as it found them, were substantially as follows:

In 1903 there were approximately 101,000 miles of wagon roads in Illinois, exclusive of streets in cities and towns. There was spent on these roads and on bridges along their lines about $4,190,000, of which amount 14½ per cent. was absorbed by administrative expenses, due to the "undoubted fact that a large part of the road and bridge tax is wasted by a system of cumbersome machinery." The information concerning road materials to be found within the State is very incomplete, for "Illinois needs a new geological survey almost as badly as it needs a new system of highway improvements." It is believed, however, that there are many sections where a supply of material is limited, and still others where there appears to be none at all; in the latter localities, the commission suggests faith in the Biblical statement: "Seek and ye shall find." It is further pointed out that those localities where material is difficult to obtain present the easiest problems in location, grades and drainage, which is some sort of compensation for lack of good gravel and stone.

There has been a hard roads law in Illinois for 22 years, and in this time 26¼ miles of highway have been built under its provisions, which manifestly fail to meet the requirements of the present conditions. As a rule, road building in the State is still in a primitive condition and not much progress has been made since pioneer days. The report accordingly suggests the appointment of a commission of three members serving without salary. They must be "experienced men of affairs, to whom no ordinary compensation would be any inducement, who will be willing to make a slight sacrifice of their own private convenience and profit for the sake of accomplishing a public good." A chief engineer, a secretary and minor assistants are provided for. This commission is to secure information bearing on all features of road work, and to plan such improvements as it deems advisable, which, if they are accepted by the local authorities, will be executed as funds become available. Half the cost is to be paid by the State, a quarter by the county, and a quarter by the township. The bill appropriates $200,000 for two years' work and $50,000 for investigations, machinery and skilled labor. The stone is to be broken so far as possible at penal institutions.

The bill is now receiving very careful attention in the legislature. It is approved generally, but some of the rural districts look with disfavor on it for fear it will result in heavy taxes. This opposition is but natural. The farmer gets very little these days in proportion to his deserts. He works hard and long; his hours of labor would throw a city union man into impassioned eloquence were they merely hinted to him. When the farmer's year is over he has very little increase in his bank book to show for his toil. When he comes to town he is called a jay and robbed. On the other hand, he is independent. He can get along without the city, but the city cannot possibly get along without him. He is a mighty good element in our country's population, and he ought to get the recognition he deserves. The State builds prisons for its criminals, costly court houses for its litigants, great hospitals for the sick, water-works, sewers, parks and a host of other works. But when the construction of State roads is discussed, the burden of the expense is no longer considered a government charge, as in the days of Washington and Jefferson, but is assessed on those who cannot carry it in the way usually provided. The assessments should be distributed over a longer period than is customary, and more attention should be paid to the thoroughly good reasons of the farmers for objecting to increased taxes.

Reducing Expenses by the Monthly Appropriation System.

It is a common observation at the present time that the great increase of late in the total amount of business done by individual concerns has been so nearly equaled by the increase in expenditures that the very moderate growth in net earnings is hardly worth the additional responsibilities incurred to secure it. As a business develops quickly, the various executive duties formerly discharged by the owner are delegated to assistants in whom he has confidence. In their desire to make their several departments show good returns, they recommend all projects that seem to have merit. The head of the company generally approves each of them as it is presented to him, only to find when the annual balance sheet is drawn up that he has embarked on too many expenditures. This is a condition in so many companies which have grown very rapidly that it may be well to refer briefly to the system of monthly appropriations for keeping down expenses.

It is manifest that the only way to keep expenses down is to allow a certain sum in advance to each department. In the case of some corporations, this allowance is made once a year on carefully prepared estimates by the heads of departments. Such a plan is hardly possible in most organizations, however, but the system of monthly appropriations seems more generally feasible. It is now attracting much attention in railway circles among the officers responsible for the maintenance of rolling stock, and was the subject of an animated discussion before the New York Railroad Club last month. As outlined in a paper by Mr. Charles Streicher at that meeting, the system is simplicity itself in its general outlines.

In the first place, full data are secured concerning the unit costs of doing different classes of work; this information includes both labor and supplies. These figures are furnished in whole or in part to all employes down to assistant foremen, inspectors and time clerks. Each month there is distributed a monthly statement of the average cost on the whole railroad of doing these different classes of work, so that each man can see how far his department exceeds or falls behind the average. In each month's reports of division officers, suggestions are made for saving money and materials and for limiting appropriations. The basic idea of this plan, it will be seen, is three-fold. In the first place it is intended to show month by month the unit cost as well as the total expenditure for each class of work. In the second place it is intended to make all employes mindful of the desirability of saving pennies as well as spending dollars. In the third place, it enables the head officer or officers to determine carefully once a month the appropriations for the next month.

This last advantage is really the most important one in most business enterprises. It is fairly certain that an assistant who cannot foresee his probable expenses for a few weeks is not much of an executive man. Anybody fitted for such a place can prepare an estimate for a month and explain the advantage of each item for which an appropriation is desired. All these items can then be considered simultaneously, their relative desirability discussed, and a decision regarding them quickly reached. This leaves the head officer free from any need of considering expenditures during the rest of the month and enables him to devote his entire attention to other subjects. It prevents him from having nervous prostration at the end of the year. It has also been found to have a strong influence on the members of the staff, leading them to practice economy in carrying on their work and moderation in requesting appropriations.

The usual reason for the nearly equal growth of expenses with gross earnings is the lack of ability of assistants to manage their departments as shrewdly as they were managed by the head of the company in its early days. Hence, anything which will tend to make these assistants more competent in their respective duties is well worth consideration, and among the many suggestions made for this purpose of late years none seems more free from red tape and better calculated to be successful than that mentioned.

No Civil Engineers Wanted.

The recent discussion concerning a proposed commission, either state or municipal, for the construction of an additional water-supply system for the city of New York has disclosed an opposition, not new, to the appointment to executive or administrative positions of civil engineers. Singularly enough, this feeling has, at various times, been expressed even by members of the profession. It is a comparatively long period since anything has occurred to revive this old opposition to placing civil engineers in such offices, but the objection is as unfounded as it ever was, in spite of the fact that at least one respectable body of citizens of New York has emphatically voiced its judgment to the contrary.

Governor Higgins has earnestly advocated the creation of a state commission which shall have at least a supervisory care of all the waters of the state available for municipal purposes. The Mayor of New York City has just as strongly advocated the creation of a non-partisan commission of three members to be charged with the duties of ascertaining a suitable source, and the construction of the works for an additional water supply for the city. Bills have been introduced in the legislature by the advocates of each procedure for the purpose of enacting into law their respective plans. A most active discussion of the whole question has been carried on before legislative committees at Albany, and by various civic and semi-civic bodies in New York. Some prominent advocates of the state commission have expressed themselves strongly against the appointment of any civil engineer as a member; even the Chamber of Commerce of New York City has set forth the same views by formal resolution. All these parties have taken the ground that only "business men" should be entrusted with the discharge of such functions. They have given formal notice that if their views obtain, no civil engineers, as professional men, are desired to undertake the administration of such important interests as the construction of a great public work.

Civil engineers must, perforce, make all the investigations and decide upon suitable sources of supply and create all the plans imperatively necessary for their construction, but the administration of those things necessary for that construction in an efficient manner is supposed to be possible only by business men. A little prejudice in their own favor possibly prompts "business men" to insist that they themselves are specially favored by the possession of administrative capacity. It may be admitted that it is a matter of little consequence whether civil engineers are appointed to either a state or city commission for an additional water supply for the city of New York, if that city secures in the shortest possible time the additional supply of water so imperatively needed to save it from a water famine, but there is a principle involved in the matter, of the greatest importance, viz.: the fitness of civil engineers for administrative positions. This principle belongs to a class about which there may be endless academic argument as fruitless as voluminous. The test of such a principle is found only in the actual accomplishment of things.

No one will be foolish enough to contend that all civil engineers possess marked administrative capacity. Indeed, a general observation of that character may be applied to the members of every known calling, professional or non-professional. There have been enough actual cases conclusively to demonstrate the fact that the majority of successful "business men" are hopelessly without those qualifications requisite for a successful member of a commission entrusted with the execution of a great public work. Within a recent period an eminently successful business man, who has amassed a large fortune in lines of business conducted by himself, signally failed as a commissioner charged jointly with others with the duty of constructing a public work of magnitude and prominence. The simple essence of the whole matter is that a commission entrusted with the construction of such a great public work as a system of additional water supply for the city of New York, requires a kind of administrative capacity radically different from that which a business man may have to exercise in the conduct of his private affairs. The latter are managed entirely for his personal gain and the element of selfishness is a strong, if not controlling, motive. The duties of a great commission are to be discharged wholly for the public welfare and absolutely without any reference to personal gain. Among other things, they require both efficiency of action and a certain quality of judicial temper and mind, for which there is little or no use in ordinary business transactions. To put it more broadly but perhaps with less definition, the personal element enters largely into the business man's business, but must be largely or entirely excluded from the commission's business.

Some business men possess this broad, impersonal, executive ability and others do not. Precisely the same observation applies to civil engineers and to members of other callings. Civil engineers in such executive positions as those of president, general manager and chief engineer of great railroad corporations exercise the most active and intense, as well as the broadest administrative capacity known in modern times, and to deny them that capacity, as is practically done in the resolutions and by the parties to whom reference has been made, is not only absurd but narrow and simple. It is fair to assume that the professional gentlemen who have filled the position of president of the Pennsylvania R. R. Co. for many years have been fairly good "business men," yet they were educated as civil engineers and followed that calling until they were appointed to executive positions. A most efficient member of the Metropolitan Water Board of Boston was a prominent civil engineer. Many municipal commissioners who have admirably discharged their duties in the construction of some of the greatest public works in this country, and, it may be said, with an honesty and a consideration of the public welfare not ordinarily found among political "business men," have been civil engineers.

The fitness of civil engineers possessing administrative capacity for executive positions should be insisted upon. Their educational training and subsequent professional practice are admirably adapted to stimulate the development of executive capacity if they possess its elements, and it is as short-sighted as it is futile for any portion of the community to set itself up as the sole possessor of such qualities to the exclusion of civil engineers, some of whom have exhibited the highest administrative capacity required in the greatest of modern corporations.

The Improvement of the Chicago Elevated Loop.

The Union Elevated Loop in Chicago in rush hours is one of the most interesting stretches of railroad in the country. It is a double-track line about two miles long encircling the business district of the city and serving as a terminal for seven different elevated lines. The closest crowding occurs for about half an hour in the morning and evening, when the headway between trains is a trifle under 20 seconds. It would be entirely impracticable to get these trains on the loop except for the skill of the switchmen, who pass a train into the loop from a connecting road and let one out of the loop at the same time, and, if they are lucky, allow still another train to pass around the loop track at the junction point while the first two trains are on the curves. At the present time all the trains are operated about the loop during the rush hours that the existing facilities permit, but there is pressing need of additional transportation accommodations. The matter has been receiving the attention of the Chicago City Council Committee on Local Transportation for some time, and a very interesting report to that committee has recently been made by Mr. B. J. Arnold.

Any such problem as this must be regarded in two lights, first, that of train movements, and second, that of facilities for getting passengers on and off trains promptly. Mr. Arnold finds opportunity for improvement in both respects. He states that the platforms are so short that the loading and unloading of the trains are slower than the switching at the junction points of the loop and the railways feeding it. He accordingly recommends lengthening the platforms so that two trains of five or six cars each can be discharging and receiving passengers simultaneously. This will prevent some of the delay now caused by the slow approach of trains to stations, in Mr. Arnold's opinion, and increase the capacity of the loop about one-quarter. Still further relief will come from the construction of auxiliary terminal stub tracks to receive a number of trains which it is undesirable to send about the union line. The most interesting suggestion is a proposal to eliminate grade crossings in a considerable measure by the elevation of some of the tracks, as is done on the lines of the Berlin elevated and New York subway roads. This suggestion is a particularly interesting one, open to few objections, because the escalator renders it unnecessary to climb long flights of stairs or to employ vertically moving elevators of small unit capacity.

The trouble in sending trains around this loop is not the only defect it possesses, for the noise from passing trains is almost intolerable at times. Mr. Arnold points out that some valuable information on this subject is afforded by a study of the noise along different portions of the road by which trains reach the Grand Central Station in New York. They first pass over an open-floored drawbridge, where the noise is greatest, then over a rock-ballasted steel viaduct where it is somewhat less, then over a rock-ballasted masonry viaduct where there is much less noise, and finally through a shallow tunnel in which the noise is so deadened that it is barely perceptible to people on the street above. From these and similar facts Mr. Arnold concludes that a masonry viaduct is much preferable to one of steel for city railways, and he makes the rather surprising statement that masonry structures could probably be built in place of steel viaducts at prices not greatly in excess of the cost of the latter, which would prevent to a large extent the noise that makes the present elevated roads such nuisances.

As the steel structures are evidently with us for a considerable time, the problem is how to improve rather than to replace them, and this involves a study of the sources of the noises which cause the trouble. Without going at all into Mr. Arnold's study of this subject, which he has carried to considerable length, he traces the trouble to imperfect track construction, imperfect rolling stock, imperfect roadbed and defects in the structure due to the elasticity of the metal and the lack of rigidity of the design. He believes in rails of at least 80 lb. with mitered ends and some form of bridge joint, large and heavy tie-plates, manganese steel special work, and frogs of a movable-point type. The rail should be carried by some kind of a solid ballasted floor, and for this purpose he recommends strengthening the existing steel structure with a reinforced concrete shell, which, he states, has been done on the bridges of several railways with entire success. Just what system of strengthening is best adapted for the Chicago structure he does not attempt to say, but recommends trying several types on sections about 300 ft. long until the best is determined. The recommendations as to rolling stock need not be considered here, as they refer mainly to good maintenance.

It will be seen from this brief summary of the report that Mr. Arnold maintains in it his well-known reputation for originality. The suggestions to eliminate grade crossings on elevated tracks and to reinforce the structure with a concrete-steel shell are novel and deserve the careful consideration of those responsible for the operation of such roads.

Notes and Comments.

A MOVABLE PLATFORM along 34th St. forms a part of plans for additional subways which the New York Rapid Transit Commission has recently adopted. The merits of this system of transportation have been fully established by the long-time demonstrations at Chicago in 1893 and Paris in 1900, and it is rather strange that the movable platform has not been suggested for the North River tunnels, for which purpose it seems particularly adapted.

THE OWNERSHIP OF WATER METERS is strongly advocated in a recent report by Supt. A. E. Martin, of the Springfield, Mass., Water Department. He states that with private ownership it is impossible to keep the meters in proper condition, as the department is obliged to wait for the owner's permission to make repairs. There is also much friction over the collection of bills for the repairs. With municipal ownership, a systematic plan for maintenance and repairs could be adopted, which would keep the meters in better condition at less expense than under the present system.

A GREAT IRRIGATION PROJECT involving an expenditure of about $25,000,000, has been authorized by the Secretary of State for India. The area commanded by the canals is about 6,250 square miles, although only a small part of it will be reached for a number of years to come. In this area it is estimated that about 3,000 square miles will be irrigated. The water will be taken from the Jhelum River, in which there is now unappropriated at the site of the headworks a flow of 5,600 to 7,900 cu. ft. per second. It is believed that the investment of public funds in these works, great as the sum may be, is well warranted by the economic advantages of the undertaking and the reasonable assurance of ample interest payments.

AN UNWARRANTED STRIKE on the lines of the Interborough Rapid Transit Co. in New York, which operates the elevated and subway system, has failed so completely that it deserves mention in this place. The skilled men who struck did so in violation of a written agreement and have been expelled in consequence from their union, while there was no trouble at all in securing good men to fill their places. As for the union of the unskilled men, that was found to be without any influence at all except as affording offices for a few men who have already dropped into deserved obscurity. The most gratifying thing about the strike was the determination of the company to insist on proper rules for the operation of its lines, even in the face of a strike that caused inconvenience to a large part of the residents of the city.

THE FRAGILITY OF STEEL is often its most important property from an engineering point of view, yet the tension test gives very little information regarding it. Hence it is interesting to learn that the Fremont machine for determining this property is now made in the United States by the Olsens, who are also prepared to make commercial tests with such a machine in their own laboratory. The Engineering Record is strongly of the opinion that samples of structural steel, boiler plates and the like which fail in service should be tested on such a machine as well as in a tension machine. If this is done it is not at all unlikely that the importance of the impact test will be speedily demonstrated. It does not require expensive apparatus, the samples are easily prepared, and the tests are quickly made. The attention of boiler makers in particular should be given to the Fremont apparatus.

THE IMPORTANCE OF ENGINEERING in the life of to-day is shown in a striking way by "The Times," the famous London newspaper everywhere acknowledged to be the most reliable daily journal in the world. It has begun the publication of a weekly engineering supplement, the first number appearing on March 1. It is a 12-page sheet containing about the same number of words as the Current News Supplement in this issue. The first number has articles by Sir Charles McLaren on financial aspects of the engineering and some allied industries, on submarine boats by Sir Wm. H. White, and on the motor omnibus by Mr. C. W. G. Little. The leader is a discussion of the electrification of railways. The greater part of the text is, however, correspondence from different British manufacturing districts on the business conditions there, short articles on important engineering undertakings, and notes on articles in foreign technical journals. It is not right to judge a new journalistic venture by its initial number, but those responsible for this unique departure in newspaperdom need make no apologies for their first effort.

THE STUBAI VALLEY RAILWAY in the Tyrol, near Innsbruck, will long be noted as the first line to be operated commercially by single-phase motors. The cars have four 40-h.-p. Winter-Eichberg motors connected in two groups in parallel, and draw trailers. There are a few freight cars among the rolling stock. The line is about 12 miles long and has some long and stiff grades. The frequency is 42 cycles, which is rather interesting in view of the American prejudice against a frequency above 25 cycles. The current is transmitted at 10,000 volts, and is reduced to 2,500 volts for the trolley wire. The road has been in operation about seven months. The consumption of energy measured at the feeding point, so as to include the losses in the secondary network and trolley wire, has been about 70 watt-hours per ton-kilometer. The mechanical power was calculated from measurements of the train resistance to be 48 watt-hours per ton-kilometer; the efficiency of the system was, therefore, about 68 per cent. It will be interesting to observe if the success of this installation and the operation of the Indianapolis-Cincinnati line in the United States will prove the long-needed incentive for the introduction of the single-phase motor on the many lines for which electrical experts assert that it is pre-eminently fitted.

THE CONSTRUCTION OF THE FARMERS' BANK BUILDING, PITTSBURG.

A Description of Rapid Building Operations.

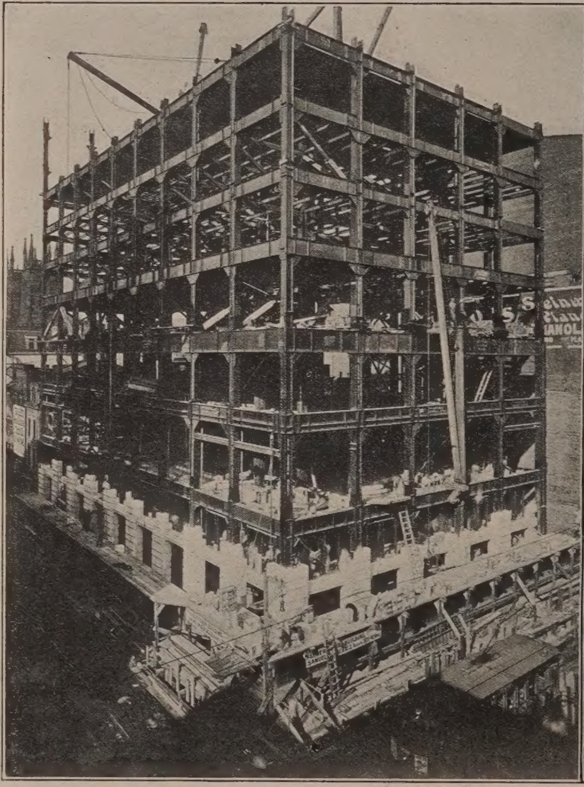
The Farmers' Bank Building, Fifth Ave. and Wood St., Pittsburg, is a 120x140-ft. 24-story steel cage fireproof office building, with basement and sub-basement, and is about 330 ft. high above the curb with marble, brick and terra cotta walls on the street fronts and brick walls in the rear and light court. The four lower stories are faced entirely with white marble and have handsome door and window arches, molded belt courses and ornamental work. The upper stories are paneled with brown roman brick and white terra cotta to make effective contrasts, and have a large amount of ornamental trimming, belt courses, cornice work and columns enriching the street fronts.

The framework contains 5,275 tons of structural steel, and has 60 main columns with rectangular cross sections built in two-story lengths with four angles and four plates and spliced, just above floor levels, with horizontal diaphragm plates and pairs of cover plates shop-riveted to the upper ends of the sections. The columns are seated on cast-steel pedestals with I-beam grillages, generally independent, enclosed in concrete and placed on the leveled gravel soil about 30 ft. below the curb. The columns have reinforced angle-bracket seats and web connections for single I-beam girders of about 17 ft. span intersecting them on center lines and carrying I-beam floorbeams about 6 ft. apart to support the flat hollow tile floor arches, which serve as fire protection for the steel, and are leveled up above their top flanges with cinder concrete made, as is the 1:2:5 stone concrete in the foundations, with Rosendale cement. The floors have wood or mosaic wearing surfaces, and the partitions are made with 4-in. hollow tile. The basement columns are fireproofed with red brick, and those in the upper stories are enclosed with hollow tile, which is also used to protect the flanges of deep beams and girders.

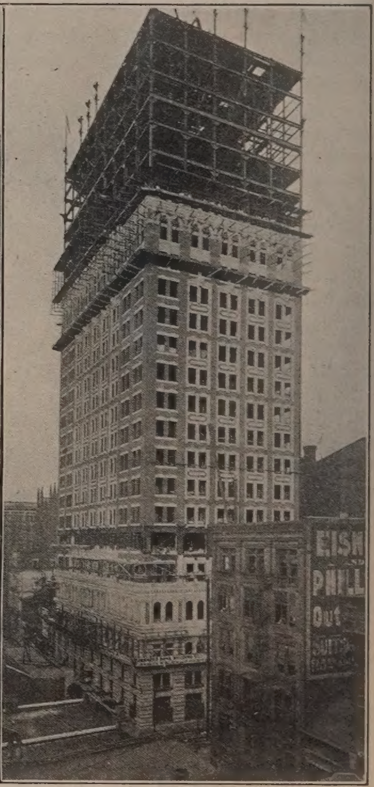
The walls are carried, independently of the floors, at every story, on plate girders which form continuous belt courses around the building in the faces of the columns or are offset slightly beyond them. The deep web connections of these girders and the solid-web knee-brace plates connecting their lower flanges to all the wall columns, and an elaborate system of cross connection diagonally between columns in outside walls are relied on to provide lateral and sway bracing for the building in connection with the rigidity developed by the rest of the structure. All field connections of the steelwork are riveted with pneumatic hammers and all the brick and stone wall-masonry was securely anchored to the framework.

Work was commenced in April tearing down the old buildings which had occupied the site, and as one of them had a party wall in common with the building removed, that side of it was temporarily closed with building paper, and the ends of the wooden floor joists were supported by vertical shores. After the walls were demolished a stiff-leg derrick was set up near the center of the site and handled most of the débris, loading the large pieces directly on wagons at street level, and delivering bricks, dirt, etc., to an elevated storage bin over the sidewalk, whence it was chuted into wagons in the street at convenience. Sidewalk bridges were constructed over the vaults, a tight board fence 10 ft. high was built on the inner edge of the sidewalk enclosing the building, and a deck was built over the sidewalks to serve as a working and storage platform and to protect pedestrians from small falling objects.

Pits were dug to a depth of about 30 ft. and in them two-bent timber towers were placed to support the masts of three stiff-leg derricks with the outer ends of their horizontal sills carried on other timber towers or extended to rest on the surface of the ground. These derricks had 35 ft. masts and 65 ft. booms of 15 tons capacity, and were used for all the excavation and foundation work and to set the first tier of columns from this position, afterwards being moved up on the successive tiers of beams to erect all the steel framework. Under one derrick mast the tower bents were each made with one vertical and two batter posts in vertical planes. Under the other mast they were made with two batter posts in inclined planes; the towers under the feet of the stiff-legs, at the ends of the sills, were made with three or with four vertical posts, and all tower posts were made of 12x12-in. timber with 3x12-in. horizontal and diagonal braces, spiked on all faces.



Starting Walls on August 11.



Erecting Columns on Oct. 8.

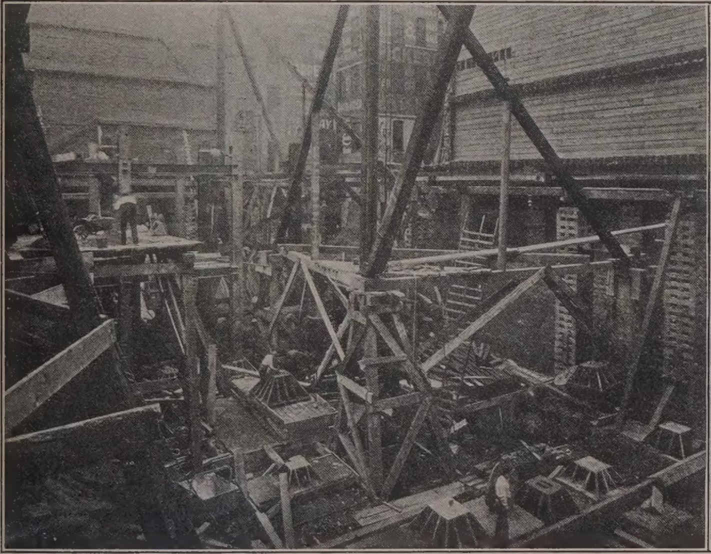
The excavation was in gravel which required secure sheeting, and was made by hand and shoveled into 1-yd. steel buckets. The adjacent buildings had shallow rubble and concrete footings reaching only a few feet below the curb level, and were underpinned with new brick walls and concrete footings carried down to the same level as the foundations of the new building. On one side of the excavation the old building had an independent brick wall about 35 ft. high, and it was at first attempted to save this wall, and ordinary transverse I-beam needles were put through it; but it was finally concluded to rebuild the wall, and the ends of the floor joists in the lower floor were supported on a line of 12x12-in. sills set on top of the needles, and the upper floor joists were carried on vertical shores seated on the lower joists. The old wall was removed and the side of the building was temporarily closed by wooden sheeting.

In both buildings the sills were carried on 12-in. I-beams about 20 ft. long, in pairs about 12 ft. apart. These were seated at each end on pairs of 12x12-in. timbers parallel to the wall and about 2 ft. clear of it outside the building and 14 ft. clear inside. These timbers were supported at intervals of about 12 ft. on timber cribs with four jack screws on top of each, by which any settlement in the building was taken up daily. The cribs were built full height at first in pits sheeted down in the cellar of the old buildings and on the site of the bank building.

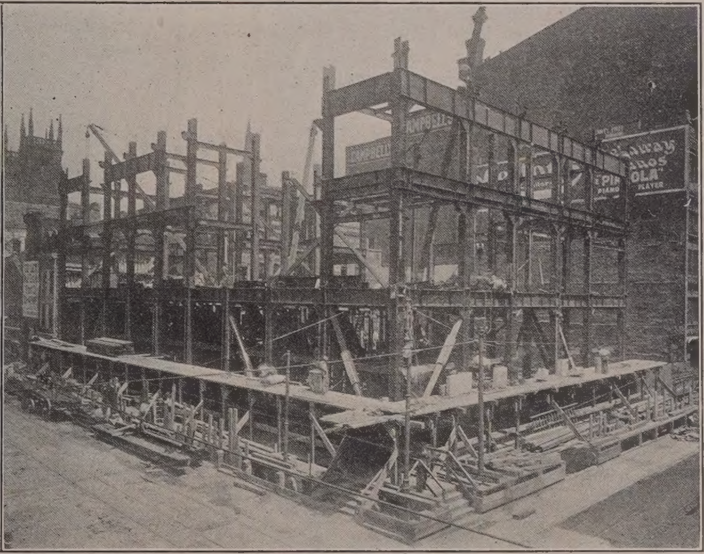
When the sides of the pit were excavated under the ends of the derrick sills the latter were supported on two sets of cribbing, one of which always carried the load while the other one close to it was built up from a lower level, and so on using and replacing each alternately until the full depth of excavation had been attained. Up to this time the derricks did not handle heavy loads and their sills were stable from their own weight; but in order to provide for the larger reactions from handling the heavy column sections the ends of the sills under the feet of the stiff-legs were supported on two pairs of vertical posts seated on a timber grillage and forming a square tower, with each of the four sides closed by horizontal boards nailed across the inner faces of the posts. The tall and narrow box thus formed was filled with broken stone, and the derrick sill, resting across the two post caps was secured to the grillage by two parts of old wire rope, making a loop at each end and fastened with standard clamps.

The bottom of the excavation was carefully smoothed and leveled and nearly covered by the independent footing with a layer of 1:3:5 concrete 6 in. thick made with Alpha and Atlas Portland cement. On this platform the grillage beams were set and covered with concrete extended 3 in. beyond the ends and sides of the beams and over the top, except where the column pedestals were seated on them. Just outside the wall columns on one side of the building a row of rectangular concrete piers about 4 ft. square was built up nearly to curb level in moulds made of rough planks hastily fitted together so that the outside was very irregular. These piers were built when it was intended to build a party wall on the east. Agreement could not be reached with adjoining property owner, so plans were changed, footings under these outside wall columns were made cantilever, and an independent wall on Farmers' Bank property constructed. They were about 4 ft. square and were made in moulds built of rough planks.

The erection of the columns was commenced about the first of June, and as soon as the first tier of beams was set the derricks were placed on it and their wooden towers were removed. On July 14 the first story steel work had been erected and work was in progress on the second story. Diagonal timbers about 10 in. square, usually made in two pieces spliced in the middle to utilize short stuff, with a jack screw at the lower end, were used as diagonal braces in between the wall columns, and beams or girders in the corner and in some intermediate panels, and similar braces were put in about one-third of the intermediate panels of the interior columns. By this system, which was repeated in all the succeeding stories, all the columns were quickly and accurately plumbed and resistance was provided for the heaviest wind stresses likely to occur before the kneebraces were riveted up.



Foundation Work on May 26.



Erecting Steel Work on July 21.

On July 28 the fourth story had been erected and some of the cut stone for the lower story street fronts had been delivered to the deck over the sidewalk bridges. On August 4 six stories of steel work had been erected, a derrick had been set for masons' use in the center of each street front, with the foot of the mast supported on cantilever timbers fulcrumed on the third floor wall girders, and a large amount of cut stone, in crates, had been delivered on the second-story deck. On Aug. 18 ten stories of steel work had been erected, brick floor arches had been built in the first six stories, falsework was erected for the seventh-floor arches, and the wall masonry had been carried up to the fourth floor.

On August 25 the steel work was erected to the thirteenth story, the third story of wall masonry was partly finished, the masons' derrick had been shifted to the fourth story, and suspension bars for swinging outside scaffolds had been attached to cantilever beams fulcrumed on the ninth floor wall girders. On Sept. 1 the steel work had ben erected up to the fourteenth story, the brick and stone walls had been built in the street fronts of the sixth story, and the floor arches had been built up to the ninth story.

On Sept. 22 nineteen stories of steelwork had been erected, the floor arches had been built up to the fifteenth story, and the street walls had been built from the sixth to the thirteenth stories. A wide solid scaffold enclosed on the outside by a high wall of horizontal boards and supported on cantilever beams fulcrumed on the third story window sills, extended across the street fronts and supported scaffolds 6 or 8 ft. high for the special stone cutters and carvers' work. A similar scaffold, without the enclosing sides, was established at the tenth story, and there were two suspended scaffolds above it on the street fronts for the bricklayers at the thirteenth and fourteenth stories.

On Sept. 29 the eighteenth story of steelwork had been erected, the floor arches had been built up to the fourteenth story, and the walls were completed to the thirteenth story, with the exception of the fourth and fifth stories. On Oct. 13 the erection of the steelwork had been completed, the walls finished and the floor arches built up to the fourteenth and nineteenth stories, respectively. After this date the walls progressed at the rate of about one story each week and rapid progress was made with partition and plastering work, carpenters', painters', marble cutters' and glaziers' work, and with the installation of the extensive mechanical, electrical, steam and hydraulic equipment. On Oct. 29 all the lower scaffolds and sidewalk bridges had been removed, and on Dec. 3 all the upper scaffolds had been removed and the exterior of the building was substantially finished, except for some glazing.

After the steelwork of the main building was erected and its walls, floors, etc., nearly completed, an extension about 40 ft. long, consisting of two panels of columns and girders, was added to one of the wings opposite the light court. The design and construction methods corresponded with those already described, except that the lower stories of the steelwork were erected by a mast and boom derrick supported on cantilever beams fulcrumed on the fourteenth floor girders in the center of the adjacent side of the part already constructed, and the upper stories were erected by a stiff-leg derrick seated on the roof of the other part of the building. On Dec. 22 eleven tiers of the steelwork had been erected and the floor arches in the addition had been completed to the ninth story. On Dec. 30 fifteen tiers of steelwork had been completed. From this point the erection was completed at the rate of about four tiers per week, and after it was finished the walls were built in several simultaneous horizontal zones by the use of a number of cantilever and suspended mason scaffolds as already described.

From the time that possession of the site was secured until the first tenant entered the new building was about 11 months 14 days elapsed time, during which there was an average force of 250 men employed. The contract price for the building was about $2,500,000, including the equipment, complete for operation. Messrs. Alden & Harlow were the architects, and the George A. Fuller Co. was the general contractor. The structural steel was fabricated by the McClintic-Marshall Construction Co., and was erected by the general contractor, Mr. J. W. Braid, superintendent.

Performance of a Railway Power Plant.

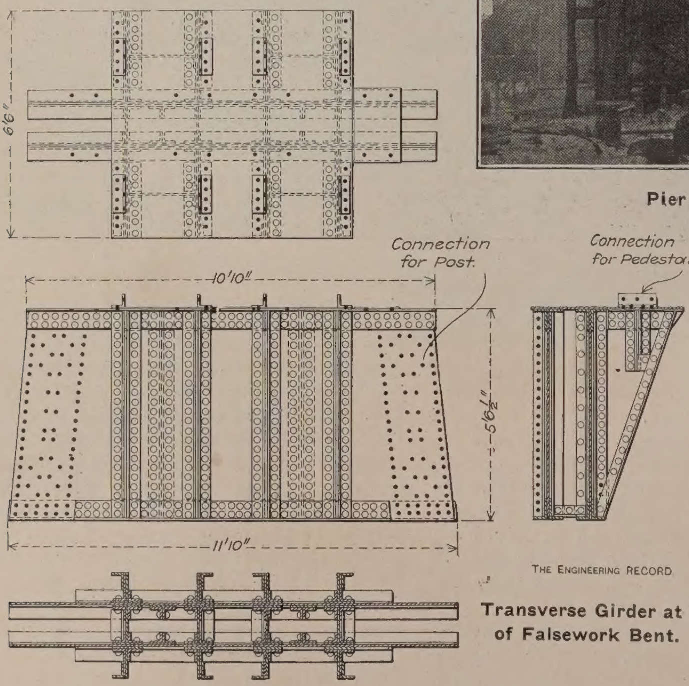
Power plant performance in the case of a station having a load which varies very rapidly between wide limits was referred to in a paper read before the Tramways and Light Railways Association by Mr. Herbert Jones on working results of the Waterloo & City Railway, London. With a line pressure of 525 to 530 volts, the load varies from 130 to 895 amperes during the heavy load periods, which occur twice a day, and is never steady for many seconds together. The output curve repeats itself at intervals corresponding to the train service, and as a general rule there are 2 min. of heavy load, followed by 2 or 3 min. of light load, according as to whether the 4-min. or the 5-min. service is being run. There are six 200-kw. steam-driven units in the station, with an output of 284 kw. when the trains at 4-min. headway are being operated, with an output of 136.5 kw. when the 4-min. headway single cars are operated, with 238.5 kw. when the 5-min. trains are operated, and 123.5 kw. when the 5-min. headway single cars are operated. It appears that 24-hr. tests are taken frequently, and that the output from day to day varies by less than 5 per cent. In the case of two tests reported 46.7 lb. of water are supplied to the boilers per kilowatt-hour over 24 hr., and 4.74 lb. of coal are required per kilowatt-hour over the 24 hr.

The Erection of the Blackwell's Island Bridge.—III.

Steel Falsework.—On account of the great weight of the spans, and the enormous concentrated loads of the travelers in service, steel falsework, closely resembling two parallel plate girder viaducts has been provided for the erection of the island and anchor arm spans. It consists of riveted transverse bents six stories high, in vertical planes 30 to 40 ft. apart, coinciding with the truss panel points, and braced longitudinally with horizontal and diagonal struts to form alternate towers and open panels. Each bent is symmetrical about the center vertical line and really consits of two bents, each having two batter posts and complete bracing, with some of the diagonal members continued across the space between the bents to unite the two sides of the faleswork.

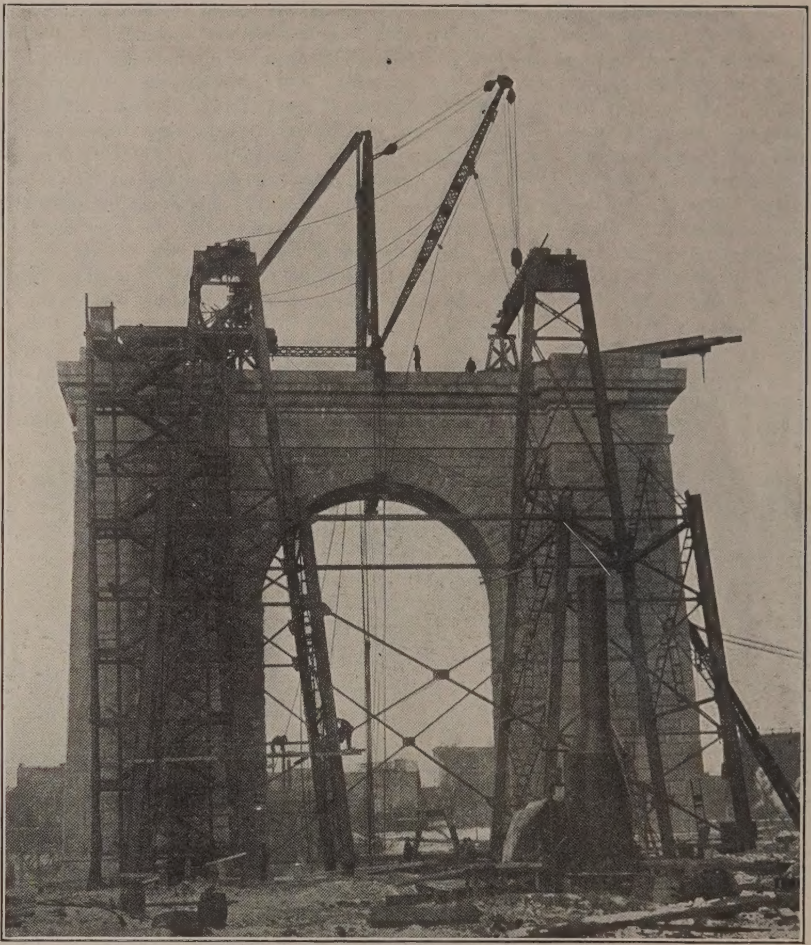
In the same way each tower may be considered as composed of two four-post pyramidal towers, on the center lines of the trusses. The posts have rectangular 20x24-in. cross sections made with two built channels, latticed and having 4x4-in. angles and 20-in. web plates. The two upper stories of all posts are made in two lengths, and the lower stories are made in either two or three lengths. The ends of the sections are milled square, and the butt joints are spliced with cover plates on all four sides, with their holes filled with turned bolts instead of rivets. All braces are connected to the columns by turned bolts through jaw plates connected to the post flanges by vertical connection angles. The feet of the posts are beveled to correspond to the batter and have riveted horizontal base plates anchor-bolted to the grillages.

The upper ends of the posts are fastened with large numbers of turned bolts between the double webs of short transverse girders with their centers in the planes of the trusses. The webs of these girders are connected by four vertical diaphragms parallel with the bridge axis, and in the same planes have outside brackets with their upper flanges supporting the 72x76-in. horizontal cap plates which form platforms under each panel point. These receive four riveted pedestals X-braced together to form vertical towers 3 ft. high, on which the camber blocking and trusses are supported in such a manner that special 500-ton hydraulic jacks can be seated on the transverse girders inside the towers and raise or lower the assembled trusses as necessary. The falsework is composed, as shown in the elevation diagram, of independent towers without any longitudinal members or stringers between the towers for the island span. The traveler sets the lower floor system in advance and moves forward on two pairs of its stringers.



Transverse Girder at Top of Falsework Bent.

The falsework posts are seated on separate grillages proportioned to reduce the load uniformly to 3,000 lb. per sq. ft. on the hard, leveled surface of the ground. Shallow pits were dug for these grillages and their bottoms covered with 3 in. of concrete on which solid timber grillages were placed supporting tiers of 15-in. 42-lb. I-beams connected at both ends by tie rods and separators. The grillages are of different dimensions according to the computed loads on the falsework posts. One of the larger ones has 9 beams 11 ft. long covering an area 5 ft. 9½ in. wide, and receiving their load through four 12-in. transverse beams in the center which transmit the pressure from the post base to their top flanges.



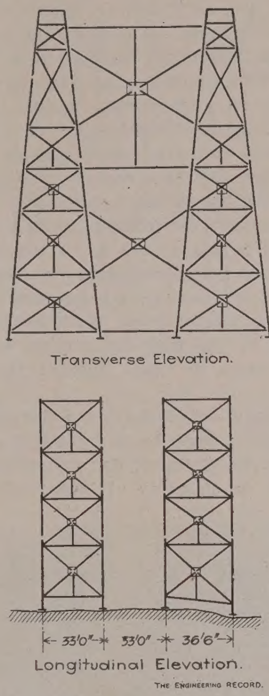
Pier No. 2 and First Bent of Steel Falsework.

The upper stories of all falsework towers are designed alike, and their members are interchangeable duplicates, all variations being made in the lower stories to conform to different heights of the ground. The falsework is designed so that after the island span has been erected it can be taken down, moved to the opposite sides of the river and re-erected there to support the anchor arm spans during their erection. Some additional bents were provided for this purpose, and as it was calculated that the towers were amply strong to carry double loads of the much lighter anchor arm spans, every third bent will be omitted in a number of cases, and next the anchorage piers the second and third bents will be omitted and the remaining bents will carry plate girder spans on top of the towers, supporting the intermediate panel points. Five bents are thus omitted on the Manhattan and four on the Queens side. Each span consists of four 5½-ft. plate girders with 6x6-in. flange angles and three thicknesses of 14x⅝-in. cover plates, with their webs bolted through double cover splice plates to the vertical web-stiffener angles in the falsework transverse girders from which, in these cases, the outside brackets will be omitted. There are four girders, 1 ft. 11¼-in. and 1 ft. 9¼-in. apart on each side of the bridge axis, each group of four having its center line in the plane of the truss. The girders vary from about 50 to 60 ft. in length, and their middle panels are stiffened with extra vertical web angles, and their top flanges there support and are connected by a 72x⅝x76-in. plate, which forms a platform on which the pedestals will be set to receive the camber blocks and trusses. The total weight of the steel falsework is about 2,200 tons, and provisions for cutting it up after the work is completed have been made by which it is expected that it can be reduced to merchantable scrap at a comparatively small cost, so that there may be a maximum salvage.

Falsework Traveler.—Except the first bents which are erected from the pier, the falsework will be erected by an overhead falsework traveler which will erect one bent in advance and placing temporary stringers in each successive panel, will move forward on them and complete the erection. This traveler has a 40x55-ft. horizontal platform made with a framework of transverse and longitudinal I-beams and struts X-braced and decked over half its surface to carry two hoisting engines, boilers and supplies. On the front corners of the platform are seated the masts of two 10-ton wooden stiff-leg derricks with booms 55 ft. long.

The stiff-legs are pin-connected to jaw plates bolted to the sides of their 12x12-in. wooden sills, the latter being in the planes of, and clamp-bolted to, the front transverse strut and the longitudinal sills of the platform. The traveler is mounted on four double-flange wheels on two rails 55 ft. apart, each of which is carried on 3 ft. ties on the top flanges of a pair of 24-in. I-beams 42 ft. long riveted together with vertical transverse separators. In alternate sets these separators are long and short, so that both pairs of beams can be set at the same level on the falsework tower caps, and on the same center line, and their ends can overlap to allow for different panel lengths.

Sequence of Erection.—While the falsework is being erected traveler No. 1, starting from pier 2, will erect the both floors of the island span, placing the lower chords and floorbeams on the camber blocks on top of the falsework towers, assembling the stringers to the floorbeams and moving forward from panel to panel on the elevated floor platform thus established. After this stage of the work is completed a 65-ton steel derrick on an independent steel platform near the center of the span will receive the steel members from the gantry cranes, hoist them to the top of the falsework and deliver them to material cars running there from pier to pier, and thence out the cantilever arms as required. By this means two-thirds of all the steel in this span, including all the heaviest pieces, will be erected in the simplest possible way with a traveler which virtually consists of two stiff-leg derricks, and all the difficulty and delays of moving a very tall and top-heavy tower-traveler will be avoided as long as possible.



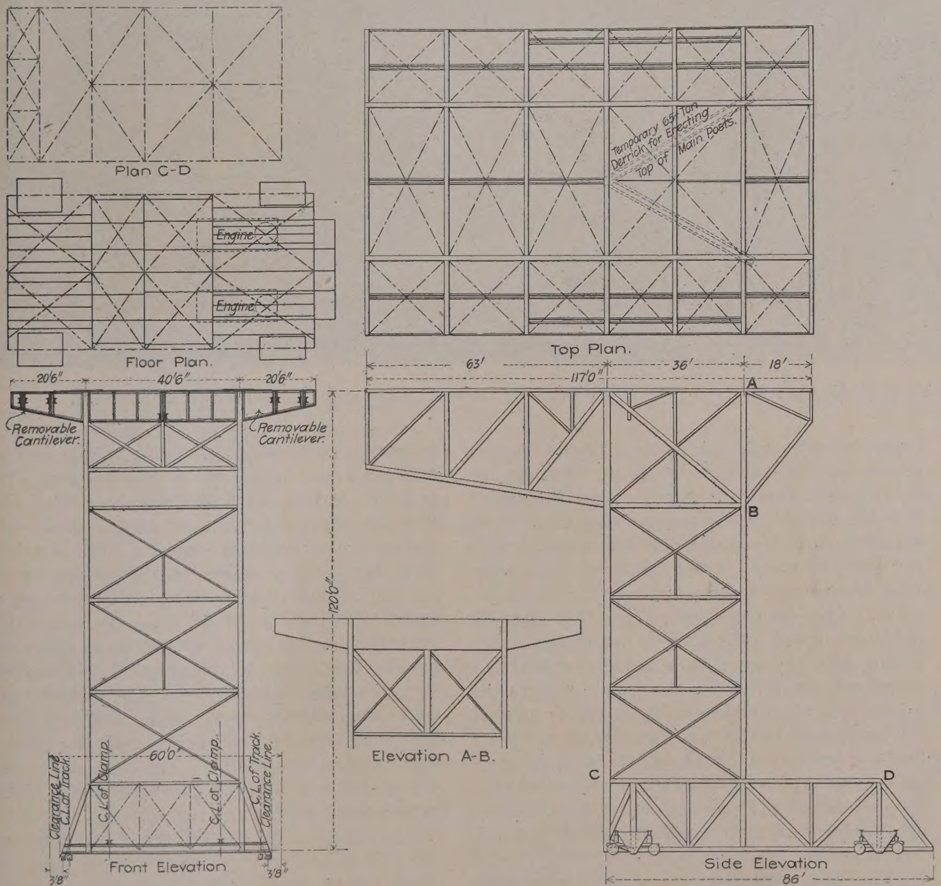
Steel Falsework Bents near Main Pier.

Some of the members are 100 ft. long and weigh 120 tons. These will be delivered from the shops in halves, which will be erected separately and then riveted together in place by a full length longitudinal splice from end to end. It is calculated that both booms of the traveler will sometimes be on the same side of the traveler at once, and the maximum reactions will be much greater than the floorbeam connections can endure, therefore the heavy lattice transverse girder connecting the feet of the derrick masts, as described, will be jacked up near the ends when in service so as to diminish the floorbeam stresses. At a point near the center of the island span the 75-ft. booms of the traveler will be changed for booms 85 ft. long, and the rear of the traveler will be equipped at all times with an auxiliary boom to handle the clamping apparatus.

After the erection of the superstructure up to the middle height of the trusses, two cantilever travelers will be erected to run between the trusses on the upper deck stringers and will complete the erection of the island span, and then, working out from both ends of it, will erect the cantilever arms of the channel spans continuous with it, to the centers of those spans. They will then be taken down and one will be transferred to each shore and there reassembled on the upper decks of the anchor arm spans, which will have been erected in the meantime by the traveler No. 1 in the same manner as the lower part of the island span. The cantilever travelers will complete the erection of the anchor arm spans and then move out from the shores erecting the cantilever arms of the channel spans to meet the first arms already built at the centers of the spans, where they will be joined directly without the interposition of the usual connecting spans.

Cantilever Traveler.—The cantilever traveler is a 36x40½-ft. steel tower 124 ft. high from base of rail, and with rigging and engines weighs about 500 tons. It is Z-shape in side elevation, with an upper truss overhanging 63 ft., enough to reach one panel in advance, and a pair of bottom trusses extending 50 ft. beyond the rear side of the tower to counterweight or clamp the overhang. The base of the traveler is extended to a width of 55 ft. to give it the greatest possible lateral stability, and the upper transverse beams supporting the hoisting tackles have 20½ ft. removable cantilever extensions at each end, giving it a top width of 81½ ft., and overhanging the trusses, which are 60 ft. apart on centers. The traveler is made with stiff members throughout, designed and built like first class railroad bridge work, and all field connections are bolted through gusset and jaw plates. It is seated on two 8-wheel front trucks and two 4-wheel rear trucks, with 5 and 8-ft. gauges 40½ ft. apart on centers transversely, the tracks corresponding with the two outside lines of permanent stringers and two lines of temporary stringers in the bridge floor.

The traveler is suspended from the trucks by saddle girders and bolsters designed to equalize irregularities of loading. It is computed that the maximum vertical stress on one side of the traveler may be 450 tons, and as this is a much larger load than the floorbeams are proportioned to take, the bearings, when the traveler is in service, are transferred as near as possible to the ends of the floorbeams by special hydraulic jacks made by the Watson-Stillman Co., and set under the transverse sills 44 in. from the truss centers. The sills are shimmed up to bearing with the floorbeams outside the jacks and are anchored to them by screw clamps about 15 ft. each side of the center line. As the travelers are to be used on a level track, and also on a



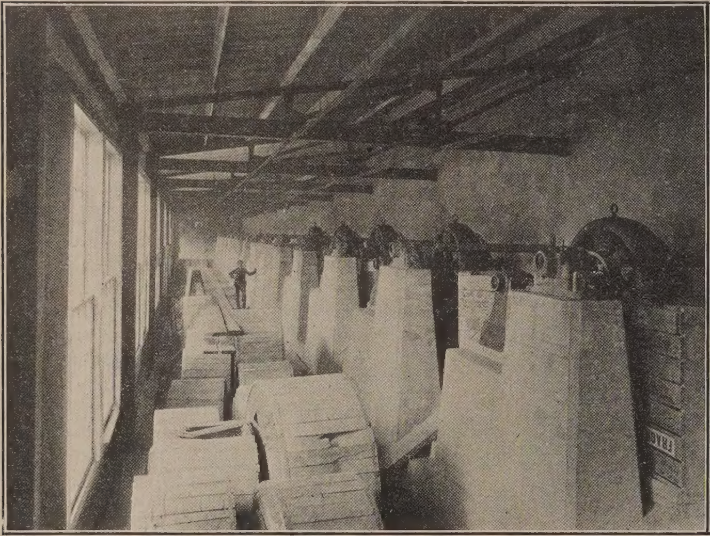
Steel Travelers for Upper Part of Connecting System and for Cantilevers.

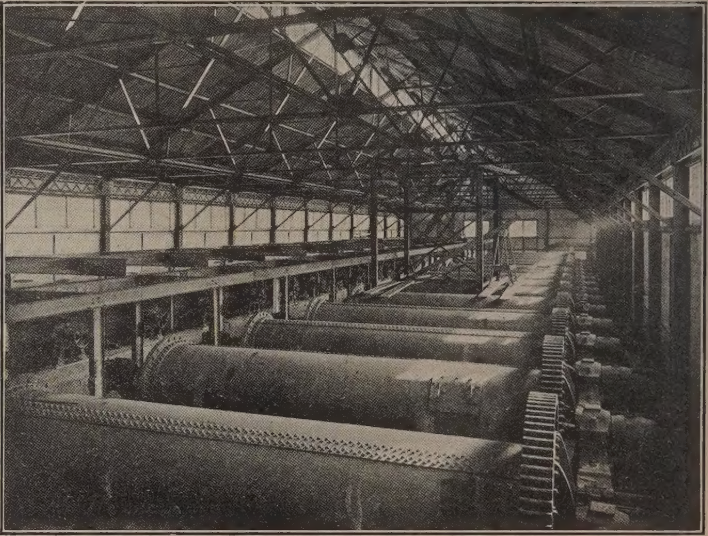
grade of 3.4 per cent., provision is made for plumbing the tower by raising the bearings on the rear trucks. This is done by jacking up the extremity of the lower trusses and changing the saddle connection there from the upper to the lower pin.

The transverse girders in the top of the tower and overhang support five lines of jigger beams, each composed of a pair of 24-in. I-beams, between which special suspenders are placed at fixed points to receive numerous hoisting tackles with capacities of from 18 to 40 tons each. The tackles are similar to those for the 65-ton derricks, and their plow-steel ropes are rove through special steel blocks with heavy cast-iron plates between the cheek plates to give the lower block sufficient weight to overhaul the tackle quickly. Each traveler is equipped with one special three-drum, six-spool, and one no-drum, eight-spool hoisting engine, which with their boilers and coal and water supplies are seated on the extremity of the lower extension and provide about 150,000 lb. counterweight with a lever arm of about 50 ft. from the center of the tower. The front part of the horizontal framework in the base of the tower is floored and serves as a working platform and convenient storage for ropes, blocks, etc.

The cantilever travelers will be erected at or near the center of the island span, and thence will place the balance of truss members and proceed to the main vertical posts at the island piers, and will erect the upper parts of these posts, above the traveler tops, with the special 65-ton derricks, temporarily seated on their upper transverse girders in the positions indicated in the plan by dotted lines. The transverse bracing between the vertical posts will be assembled and bolted up complete, and the diagonal members connected to the tops of the posts will be supported temporarily by falsework on top of the traveler until the adjacent vertical posts are erected. This plan permits the erection of all members and the completion of truss joints, from the top downwards, and obviates the difficulty of supporting some members while others are being assembled for a given panel.

The island span being completed to the main posts, the lower transverse bracing between the latter will be removed, allowing the travelers to pass through, and will be immediately replaced and permanently riveted. From the piers to the ends of the cantilever arms the travelers will complete the trusses and all bracing as they go.


House for the Eighteen 100-H. P. Tube Mill Motors.


Tube Mills before Installation of Bins and Conveyors.

The National Portland Cement Works, Martins Creek, Pa.—II.

The Kiln House.—The kiln house, while in line with the grinding house, is wider than the grinding room proper, containing the rotary kilns, which, placed transversely across the building, are, as stated, arranged for extension whenever desired. At present the lateral space which may ultimately be taken up by the longer kiln is occupied under the floor level by a rotary-tube or preliminary cooler. Generally speaking, the equipment of the kiln room does not present any novelties, but from the rotary coolers the partially cooled clinker is delivered to vertical clinker coolers, and the forced-draft apparatus for feeding pulverized coal into the kilns is augmented by a supply of compressed air introduced into the coal feed to spread it outward as far as possible against the walls. The extreme width of the building brings it in line with the outside walls of the motor rooms on each side of the grinding house.

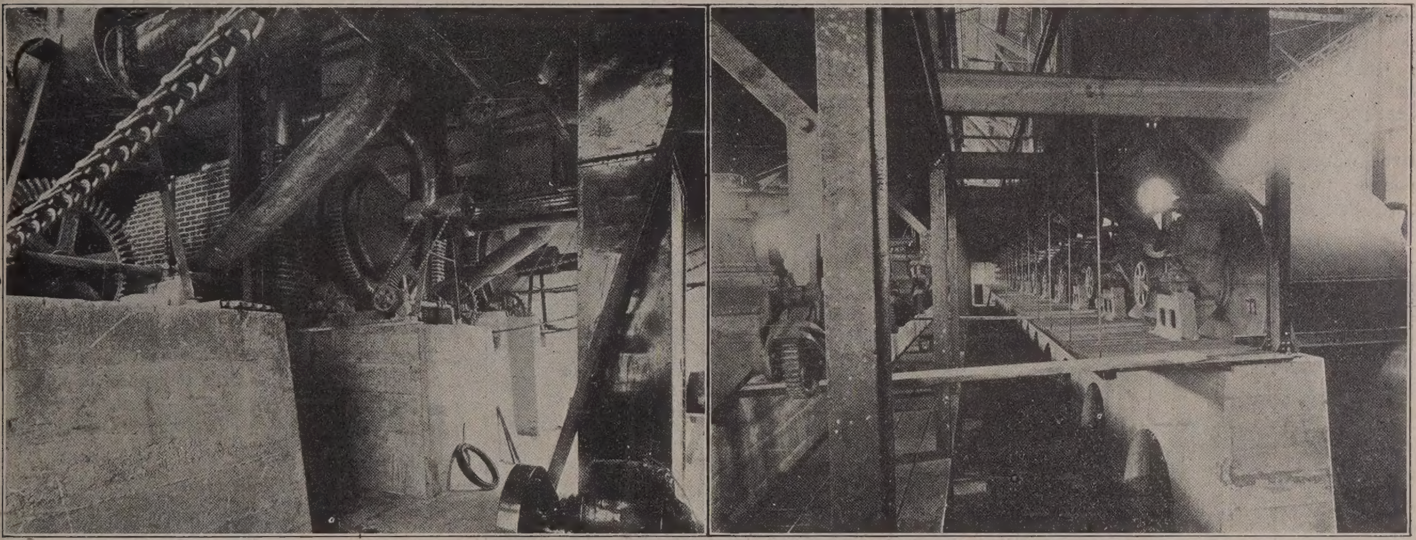
As already stated, there are sixteen kilns all told. These were built by the Vulcan Iron Works, of Wilkesbarre, Pa., and are 60 ft. long and 7 ft. in diameter at large end and 5 ft. 6 in. at the stack. The kilns are all driven from a longitudinal shaft which extends underneath the kilns through the farther wall of the kiln house, where a motor room is located between the kiln house and the coal mill. Here arrangements are made for the connection to the shaft by spur gearing of either one of two 180-h.-p. motors, one being the reserve of the other. Each kiln is driven from this shaft by a Mosser speed regulator of the double interlacing cone pattern. Each individual drive is, of course, controlled by clutch mechanism, and includes the feed from each kiln hopper as well.

The raw material is elevated to a screw extending longitudinally across the kiln hoppers. At the delivery end of the kilns the clinker is spouted into the rotary cooler, which is about 23 ft. long and 3 ft. in diameter. The partly cooled clinker from these coolers falls into the boot of the elevator, by which it is emptied into the main clinker cooler. These are of the type described in the article in The Engineering Record of Oct. 5, 1901, on the Alpha Portland cement plant at Raubsville, Pa. One of the views shows the eight coolers, but at the time the photograph was taken the elevators had not yet been installed. From the small opening shown in the top ring of each cooler an overflow spout is also now in position, to deliver the excess in a pile outside of a kiln house. It is intended to install an automatic measuring device at the cooler top, which will give a record of the performance of the pair of kilns supplying the cooler, and also of the output for both the day burner and the night burner. The coolers were built by McDermott Bros., of Allentown, Pa.

The cooled clinker falls from the coolers upon a longitudinal belt traveling through the concrete foundation on which each cooler is set. The discharge from the cooler is controlled by a hand-operated gate. At the grinding-room end of the line of coolers the belt discharges upon an automatic measurer, for the addition of the proper amount of gypsum. This is stored in a wooden crib-construction tower immediately outside this part of the building. After the gypsum has been added, the mixture is carried on an inclined elevator leading to the belt conveyor in the upper part of the grinding house. This conveyor is a counterpart of the one employed for the distribution of the raw material to the ball mills, and lies in line with it. Likewise it is equipped with a tripper, which dumps into spouts leading to the clinker ball mill hoppers. It has already been explained that while nine are ordinarily reserved for operating on clinker, one more or less may be employed for this part of the process. The progress of the material from ball mills and through the tube mills is that already described. The finished material from the tube mills falls into a screw which delivers to the far end of the building from the kiln house, at which point it is taken by a cement screw-conveyor in the tunnel extending to the stock house. The views in the grinding house show the ball mills, together with the arched foundations on which they are supported, and which give ready access to all points over the general floor area. The view of the tube mills was taken before the central group of vertical elevators was installed, or the bins for either the tube or ball mills or the conveyors overhead were in place.

The Stock House.—The stock house has not yet been built, but the foundations have been constructed, as well as the tunnels which form a part of the distributing system. As indicated in the cross-section, the cement screw from the grinding house can deliver to either one of a pair of elevators, each of which dumps into an overhead distributing screw discharging into the bins. The bins are to have flat bottoms nd there will be three rows. The bin portion f the stock house is 104 ft. wide and 225 ft. ong, and there will be nine bins in each row. The total capacity of the stock house is to be 30,000 bbl. While the site of the plant has been purposely placed at high level, in order o prevent losses and shut-downs with flood, he walls of the bins will be carried up solidly some 20 ft. above the finished grade, leaving bins 17 ft. deep. Under each row of bins a longitudinal tunnel, which has already been built, will provide for handling the cement when it is to be packed for shipment. Each of these tunnels, which has an arch roof, and is about 6 ft. wide and 8 ft. high, is to contain a 20-in. belt running underneath the outlets from the bins, spaced 9 ft. apart, to elevators in the packing house. There will be an elevator for each belt, lifting the cement to a conveyor over the packers. There will be a railway siding on each side of the stock house, and the packing house floor will be on a level with the floors of the cars. The equipment is to include six-barrel packers and twelve-bag packers.

The Coal Pulverizing Plant.—The coal mill includes three Allis-Chalmers coal dryers, a 40-in. Stedman disintegrator, and three tube mills of the type and size used in the grinding department. Coal from cars on the siding immediately outside of the building will be dumped through a grizzly to a Jeffrey crushing roll immediately under the grizzly, and the coal will be carried by an elevator and conveyor to the three bins above the three dryers. The dryers are arranged so that part of the products of combustion from the heating furnace may, after passage around the outside of the revolving cylinder, be conducted through the center of the cylinder and thence into the stack. Each dryer is 4 ft. in diameter and 35 ft. long, has an inclination of ¾ in. per foot, and is revolved at a speed of 3.5 r.p.m. From the dryers the coal is conducted in turn through the disintegrator and through the tube mills. From the latter it is elevated and conveyed to the bins in the kiln house, of which there is one opposite each kiln.


National Cement Plant: Receiving Ends of the Coal Dryers; Ball Mills, showing Concrete Foundations above Floor Level.

The apparatus for the coal-burning system in the kilns includes three 42-in. Sturtevant centrifugal blowers which deliver through a system of ducts into 5-in. branch pipes leading into each kiln. The air handled by each blower is drawn through the rotary clinker coolers and is conducted from the latter through the passages where the hot clinker falls from the kiln to the rotary cooler; the suction ducts are finally run to the fan inlets. A usual type of controllable feed from the bottom of the pulverized coal bin is provided, and the compressed air line which is introduced into the center of the 5-in. pipe near the kiln end is to be carried at 45 lb. pressure. The coal-burning apparatus was furnished by the B. F. Sturtevant Co., of Boston.

The motor installation for the coal mill is likewise housed in a room immediately outside, this space being located between the kiln house and the coal mill and containing the kiln motors already described. A 15-h.-p. motor drives a shaft from which the three dryers are revolved. A 40-h.-p. motor serves the disintegrator, and each of the tube mills is equipped with a 100-h.-p. motor. Besides these motors there is also in the room a motor-driven Stilwell-Bierce & Smith-Vaile triplex pump of 160 gal. per minute capacity. This is installed to take water from the creek and circulate it through the feed mechanism from the raw-material hopper of each kiln. In order that the burner may be sure that this cooling system is in operation, the branch water pipe at each kiln is terminated in a goose-neck which empties into the funnel mouth of the continuation of the pipe, so that the flow of water is visible from the front of the room.

The conveyor drive for the distribution of the powdered coal to the kiln room is also located in this motor house. It may be added that the transmission machinery in the coal mill is very largely a chain drive, with the Milwaukee type of chain. One of the few exceptions in which the motor is not located in a room by itself is the case of the drive for the centrifugal blowers of the coal-burning system, the motors in this case being direct-connected to the blowers. Another instance is the motor for the stone elevator in the grinding house. Here the motor is of the enclosed type and the reduction gearing is protected by a gear case.

Power Production and Transmission.—The power plant is equipped with water-tube boilers, which are fitted with Murphy stokers, supplied with a coal and ash-handling plant, and served with Sturtevant induced-draft outfit. In its general features the plant is noteworthy for the commodious and well-lighted interiors and the accessibility of the apparatus distributed in the basement. In line with the care taken with respect to well-appearing exteriors, the interior of the engine room will comprise one of the exhibition features of the works.

The boiler plant consists of seven 400-h.-p. units, built by the Erie City Iron Works, with space at one end for an additional boiler, if future requirements should demand it. The steam is, of course, all utilized within the power house, except such as may be distributed for heating purposes, and the extent of the requirements is, in brief, as follows: It was determined to install three 1,200-h.-p. generating units, so that any two with 50 per cent. overload would be sufficient to meet the average maximum demands; these units were installed under a guarantee not to use more than 14.5 lb. of steam per indicated horse-power-hour. While lighting can be supplied from these units, a 50-kw. unit was installed specially for such service, this providing a small electric unit when either a small amount of power and lighting might be needed over some repair period. For the supply of compressed air in the quarry a 165-h.-p. compressor was installed, while a second compressor was especially provided for the supply of compressed air to the rotary kilns.

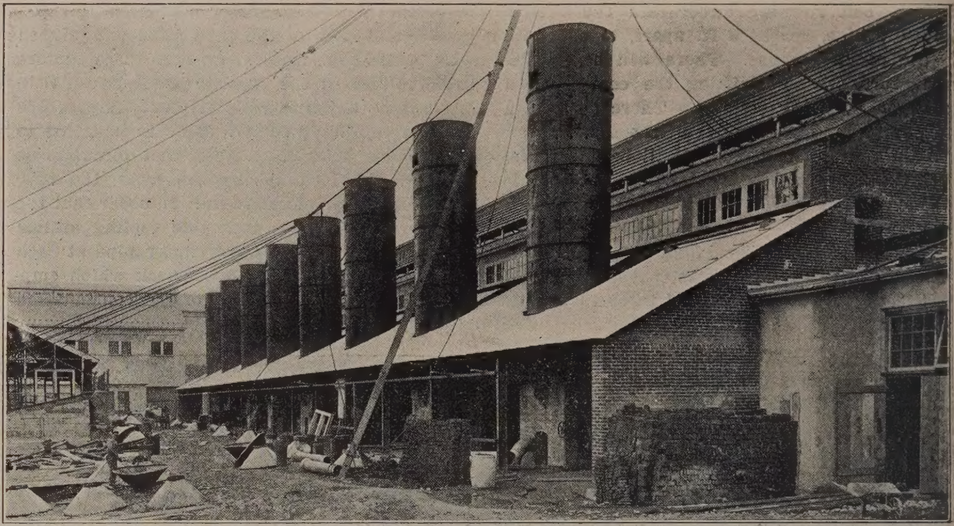
The boilers are set in batteries of two, leaving the seventh as a half battery. The accompanying view in the boiler room during construction shows the stokers provided for each boiler and the structural framework for the coal bins, which had not yet been put in place. The coal-conveying system comprises a vertical bucket elevator and an overhead continuous belt with tripper, the former receiving coal dumped from the railroad siding through a Jeffrey crushing roll and dumping it upon the latter, by which it is distributed to the bins. These are built of 3/16-in. steel of the hopper-bottom type, and hold altogether about 115 tons, which is somewhat over the amount needed for a day's run, estimated to average 90 tons. The vertical elevator is also employed to handle ashes when coal is not being received, and the design of the boiler settings has contemplated the following method of ash handling:

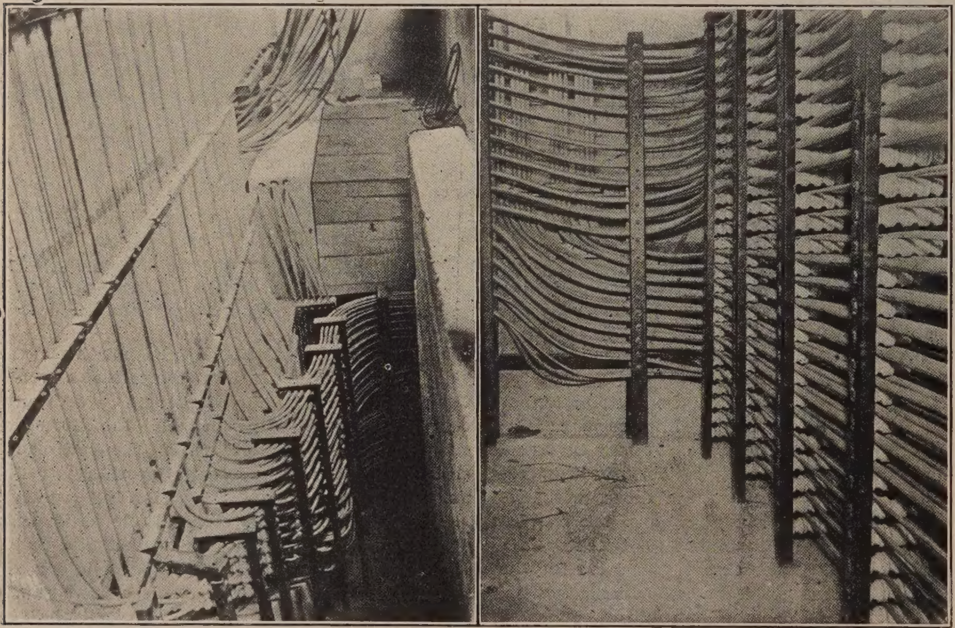
Below each Murphy furnace is an ash hopper 8x8 ft. square at the top and of an inverted pyramidal form, 2 ft. 7 in. deep. This is built of expanded metal and concrete 2 in. thick. The walls rising through the basement for the support of the boiler setting form a room enclosing the space containing the hopper, and when the ashes are to be dumped from it, a three-wheeled barrow or cart is pushed underneath the inverted apex, and by means of a hand-operated gate the contents of the hopper will be discharged upon the barrow. The ashes are then wheeled to the boot of the elevator and discharged outside the building into a railroad car or such vehicle as may be employed to convey them away.

The products of combustion are carried downward and conducted through a central passageway in the basement toward the center of the boiler house, where the induced-draft outfit is installed. This is noteworthy from the size of the fans, which are 14 ft. in wheel diameter and 5 ft. wide at the periphery. The two fans, which, of course, may be bypassed by direct connection with the chimney stack, are each driven from a horizontal side-crank engine, and the units complete were furnished by the B. F. Sturtevant Co. The fan engines have 10x16-in. cylinders and are equipped with a Foster regulating valve which will control the speed of the engines according to the steam pressure maintained, and an interesting fact is that the engines are to be operated condensing. The smokestack, as a result of the mechanical-draft installation, does not, of course, rise far above the power-house roof.

The water supply to the boilers is arranged to include the warm water received from the cooling system of the kiln feed spouts. The boiler feed pumps are installed in duplicate and are located in one end of the boiler-house basement, with an opening in the boiler-room floor and a stairway, so that they are readily accessible to the boiler attendants. Alongside of them is a Webster open-type feed-water heater, and above this, coming within the boiler room proper, is a tank 5 ft. in diameter and 16 ft. long. This constitutes a reservoir for the warm water, which will come to the boiler house at an average of 110° Fahr. This water, it will be recalled, is pumped by a triplex pump in one of the motor rooms. Ordinarily the water from this tank will flow by gravity, into the feed-water heater, under control of the heater float, where it will be still further heated by the exhaust from the feed pumps and condenser pump.

The feed pumps are 8 and 12x7x16-in. Dean Bros. compound, duplex, outside-packed, plunger type. They are controlled by Murray regulators. Besides the suction line from the feed-water heater, which, of course, may be bypassed, is a second suction line brought into the building from a cold well immediately outside, so that there is a double source of water. Similarly the pumps can deliver into either one of two pressure mains, one called the hot main and the other the cold main, and these connect into a feed main proper, which is divided into two branches, one branch feed main carried along the front of the boiler settings and the other along the rear of the settings. A meter connection is provided on the delivery main and also on the branch to each boiler, so that whenever desired records can be conveniently obtained of the performance of any part of the boiler equipment. Chapman valves are used largely throughout this system.


Clinker Coolers alongside Kiln House.


Wire Chamber Back of Switchboard and Wire Supports in Tunnels.

The steam pipe connections from each boiler are formed into long-radius bends, which are dropped downward behind the settings and through the partition wall between the engine and boiler rooms into a steam header which is carried in the engine-room basement, immediately below the engine-room floor. As a result, practically no piping is visible in the engine room. The header is divided into three sections. Steam is supplied to each engine through a Cochrane steam separator.

The exhaust main is supported immediately below the live-steam header and is run toward the end of the power house to a central condensing unit. This is planned to serve the entire steam machinery in the engine room, as well as the mechanical draft fan engines, and is of the jet type, with a Dean vertical 24 and 48x48-in. air pump. The exhaust main, as noted, is 36 in. in diameter at the condenser, the injection pipe from the cold well outside is 14 in. in diameter, and the discharge from the condenser is 20 in. The usual relief valve is provided, of the Gallison type, and the free exhaust pipe is carried outside the building, where it is capped with an exhaust head. Alongside of the condenser is a space for the fire pump, which has not yet been installed. This is to be a 1,000-gal. Blake pump, and will be fitted with a 12-in. suction to the cold well and an 8-in. fire line connected with hydrants and hose connections distributed about the plant. It will be arranged to maintain a 10,000-gal. tank, which will be supported above the gypsum tower.

The cold well referred to is a part of the arrangement for water supply, which contemplates the impounding of water from Martins Creek by means of a shallow dam and the diversion of this water through an underground passage to a concrete intake already built. From this intake a conduit will lead to a large circular masonry well from which the suction lines noted are taken. An overflow from the well leads to the creek and serves also to carry the discharge from the condenser.

The main generating units consist of horizontal compound engines built by the Erie City Iron Works, and 800-kw., 275-volt, direct-current Wood generators built by the Fort Wayne Electric Works. The engines are 26½ and 53 in. in cylinder dimensions, with a 36-in. stroke, and the normal-operating speed is 120 r.p.m. They are designed for a continuous 50 per cent. overload. The inlet valves to the steam cylinders are of the slide pattern and the exhaust valves of the Corliss gear. Each has a flywheel governor and a Monarch engine-stop is contemplated. The 50-kw. unit is wound for the same voltage and consists of a 12x12-in. Erie City Iron Works engine and a Wood dynamo. While the motors throughout the plant, which were also built by the Fort Wayne Electric Works, are wound for 250 volts, the lighting is planned for 120 volts, with a three-wire distribution. For balancing between the two legs of the three-wire circuit, a 5-kw. motor-generator balancing set is provided in the engine room.

ıe 165-h.-p. compressor for the operation the quarry drills is a cross-compound R d machine, operated condensing, as stated, worked in two stages on the air end for a ıltant pressure of 85 lb. The smaller com- ssor is a duplex Rand, supplying the air for kiln coal feed, at 45 lb. per square inch, a . line serving for this purpose. Air reser- rs are provided in the engine-room base- ıt and the latter system may be run from former through connections between the ks. The engine room is spanned by an 000-lb. hand-power crane built by Messrs. red Box & Co., Philadelphia. The crane ders are carried by steel columns of the ucture of the power house, but the columns enclosed with expanded metal and concrete, l the resulting pilasters are terminated with oitals immediately below the girders. Arc ht bracket arms spring from the girders.

The switchboard will occupy an elevated sition across one end of the room. There is partition extending from the floor to the itchboard gallery, some 8 ft. in front of the d wall of the room, and this design gives an undant amount of space behind the board. ıe chamber thus formed is extended down- ard below the general floor level to the beginning of the extensive tunnel system provided for the electric conductors. In this lofty, well-lighted area the conductors from the generators to the corresponding switches and from the feeder switches to the transmission lines can be conveniently arranged and inspected at any time, and to reach the tunnel a stairway descends from the engine-room floor to the tunnel mouth. The wire area is, of course, partitioned off also from the engine-room basement.

The greater number of cables, by far, are, of course, for the motors, the individual large size and aggregate capacity of which are indicated in the accompanying table. This, however, is a summary only of the motors for the main divisions of the works and not a capitulation of the entire motor load. The total of the list as given is 3,755 h.-p. The mass of motor feeders are shown in the view of the chamber back of the switchboard, while those at the upper rear are the generator leads in process of arrangement, and the three groups below them, carried downward to the tunnel, are the lighting feeders.

Table of the Main Motor Installations.

		Horse-power.
2	rock crushers, at 60 h.-p.	120
3	rock dryers	15
16	ball mills at 60 h.-p.	960
18	tube mills at 100 h.-p.	1,800
	Grinding room conveyors	40
16	kilns, duplicate motors of 180 h.-p.	360
2	stock house, at 40 h.-p.	80
3	coal dryers	15
	Coal disintegrator	40
3	coal tube mills at 100 h.-p.	300
	Conveyors, coal plant	25

The method of carrying the electric conductors in the tunnels is noteworthy from its substantial character. The tunnels average 8 ft. in height, so that a man can easily walk through them, and they are about 5 ft. wide. The wires, which have a lead-covered insulation, are carried on white porcelain thimbles threaded upon bolts fixed into the timber framework of the cable supports. The woodwork of the system, which has a preservative paint protection against moisture, consists of pairs of vertical uprights about 1x3 in. in section, one placed against the side wall of the tunnel and the other standing a few inches from it, or sufficient to allow for the necessary number of porcelain thimbles. In general, the wires are carried in lines four abreast, and they are spaced closely together vertically, on about 9-in. centers. The wooden verticals are spaced about 3 ft. apart longitudinally along the tunnel. In the coal mill, where every precaution was taken to lessen the fire risk, the wiring for lighting consists of the so-called brewery cord to the pendant lights, with micanite sockets to the lamps themselves.

Engine and Boiler Rooms of Power House, the Latter Showing Induced-Draft Fan and Coal-Bin Structure.

General Construction.—In conclusion, the construction of the buildings may be referred to briefly. The walls throughout are about 2 in. thick, with the exception of those of the outside walls of the power house, the concrete being applied to expanded metal. The frames of the building are steel structures carrying steel roof trusses and slate roofs. The expanded metal is fastened to ¾-in. channels spaced about 16 in. apart horizontally as studs. The outside walls of the power house are double, so that air space could be provided and the leakage of water or moisture prevented. The floors throughout are generally to be of cement. In the engine room a granolithic finish is to be applied. In the kiln room, the Hennebique type of reinforced-concrete floor construction is used, the kiln room having a basement where access is had to the rotary clinker coolers and the bottoms of the clinker elevators. It is not intended to carry any insurance on the plant, owing to the fire-resisting type of construction. Practically, the only portion of the works where slate was not employed as a roof covering is the lean-to occupied by the clinker coolers. Here it is of corrugated galvanized iron.

The plant was built for the National Portland Cement Co. by the Superior Improvement Co., as the construction company, Mr. W. B. Shaffer being the sub-contractor for the engineering and the superintending of construction. Mr. H. D. Higinbotham is president of the National Portland Cement Co.; Mr. H. N. Higinbotham is vice-president, and Mr. J. W. Williams, secretary. The plant was designed by Mr. C. L. Carman, formerly of the Gates Iron Works, as chief engineer for Mr. Shaffer and later for the National Portland Cement Co.

The Construction of the Diamond Building.

The Diamond Bank Building, Pittsburg, is a twelve-story and basement steel-cage office building which occupies a five-sided area about 121½ ft. long and 59½ ft. wide, and fronts on Fifth Ave., Union and Liberty Sts. The site is low and wet, and being subject to floods which rise a foot or two above grade, made it necessary to provide special features in the construction and for the execution of the work. The site was enclosed by double rows of sheet piling; excavation was made in successive sections; successive systems of heavy braces were installed to resist the lateral earth pressure and to support the steel and concrete retaining walls; the lower tiers of columns were erected in groups and utilized to provide reactions for the outside lateral pressures, and a large amount of pumping was accomplished by a battery of steam pumps.

The old buildings on the site were demolished and the débris in their cellars was removed in steel buckets hoisted by a stiff-leg boom-derrick and dumped into wagons in the street. The derrick was provided with ballast platforms in its sills, loaded with piles of stone, and was moved around on the old cellar floor as required. On the three street sides of the lot 3-in. sheet piles about 25 ft. long, with square edges, were driven by hand in two rows parallel and lapping joints, to form sheeting and support for the earth outside the sidewalk curb line, horizontal transverse braces being placed in the usual way as the excavation progressed. The sheet piles were just beyond the vault walls, and the sidewalks were carried over the trenches on bridges where necessary. The walls of the adjacent buildings were supported on needlebeams while their old footings were removed, trenches under them sheeted down to subgrade and new foundations built in them.

After the completion of the sheet piling on the street sides, excavation was commenced opposite one of them, the hard fine gravel being dug with pick and shovel, loaded in steel buckets, hoisted by the boom-derrick and dumped into wagons in the street. As fast as the soil was removed the pit was drained by steam pumps in one or more sumps and the row of sheet piles was braced by inclined struts bearing on two tiers of horizontal waling pieces about 5 ft. apart. The feet of the struts were set against the opposite side of the first section of excavation, which was only about 28 ft. wide. When a sufficient area had thus been excavated, the bottom was quickly leveled and covered with 8 in. of Portland cement concrete, waterproofed and the grillage and reaction I-beams set on it and surrounded by more concrete filled in level with their top flanges. Distribution girders and column bases were set on the grillages, and the lower two-story sections of columns in the wall and in the next inner row were erected and connected by their permanent beams and girders, making a tower against which two tiers of 12x12-in. horizontal beams were set to bear against the sheeting and replace the braces.

Similar operations were conducted on the other two street sides, except that in some cases only a single row of sheet piles was found necessary, and the inclined braces were removed after the columns were erected. Forms were constructed, utilizing the outside row of sheet piles for one face, and in them the vault retaining walls were constructed. Where there was only one row of sheet piles the inclined braces were allowed to remain undisturbed and penetrated through the inner faces of the molds, and openings were left in the concrete wall where the braces occurred, and these openings were filled in solid with concrete after braces were removed. After the retaining walls had thus been built the core in the center of the lot was easily excavated, the remainder of the concrete floor and grillage seams set and the rest of the columns placed.

Some very heavy triple-web distribution girders were set on the grillages, and were lowered to place from the street on inclined skids by the use of preventer tackles operated by the derrick engines. After being lowered the girders were skidded to place and turned over by the aid of the derricks, as shown in the accompanying illustration, where the grillages are seen in position on the lower concrete base, and adjacent to them are I-beams provided to stiffen the floor against possible heavy upward hydrostatic pressure. Near the center of the picture are seen some of the five 20-in. cast iron vertical sleeves bedded in the concrete to provide for the holes afterwards drilled over 100 ft. deep for the plungers of the hydraulic elevators. The foundation work was handled by two boom-derricks seated at street level, on timber towers, and having their sills clamped to the permanent floor beams.

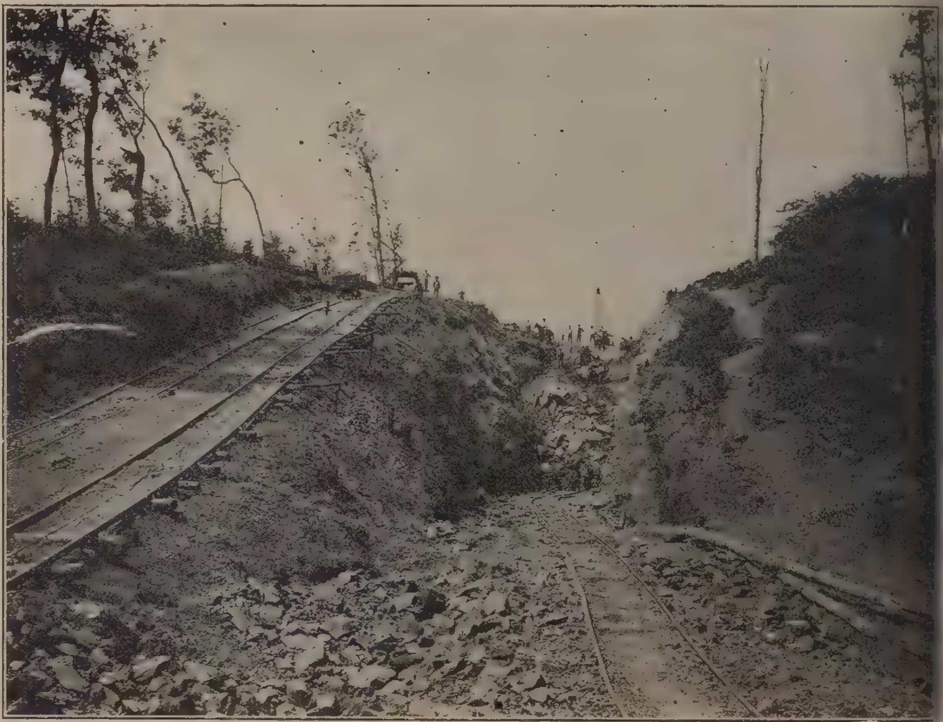
The 42 columns have closed rectangular sections and are made in one, two and three-story lengths, spliced about 2 ft. above floor level by pairs of cover plates shop-riveted to the lower pieces to make jaws connected to the upper sections by rivets driven by hand in the field. There are no diagonal or kneebraces, but several lines of main transverse girders are made with pairs of 20-in. I-beams, with their webs riveted to deep connection plates on both sides of the columns, which are proportioned to give the required transverse and lateral rigidity. These field rivet holes were at least 70 per cent. filled with service bolts when the girders were assembled and afforded ample stability without temporary diagonal braces in the vertical planes. Care was taken to plumb the four columns first erected near the center of each tier and to connect them rigidily with beams and girders checking their verticality with a transit so as to afford a solid tower insuring the accuracy of the positions of all the other members in that tier. All the steel work was hoisted from trucks in the street and assembled by one stiff-leg derrick successively moved up from tier to tier of floorbeams as the erection progressed. This derrick was operated by a hoisting engine located at street level and had a boom about twice as long as its mast. It was set near the center of the building, and after erecting all the steel work on the area outside the stiff-legs the boom was shifted to the inside of the stiff-legs, so as to command the area previously out of reach between the planes of the stiff-legs.

The construction of the hollow-tile floors followed about six tiers below the erection, and the outside walls were commenced when the steel work was up about ten stories. The fifth story of the wall masonry was commenced before the first four stories were completed, and after the gap between these two sections was closed, work was commenced at the eleventh story and the upper and intermediate parts of the walls were built simultaneously. The masons' platforms were supported on wooden cantilever beams projecting through the windows and reacting against the floorbeams in the next higher tier. After the walls were built as high as convenient above the platforms pairs of vertical posts about 5 ft. high were set on the cantilevers, scabbed to them and braced by longitudinal and transverse diagonal planks and the floor boards were moved up and placed on their caps. As the men worked away from one end of this second platform the cantilevers were removed and set again in the windows next above, and so on, always being handled by light hand tackles on the ends of cantilever beams projecting out of upper story windows. The steel work weighed about 1,100 tons and was erected in about 65 working days by an average force of 20 men.

McClure & Spahr, Pittsburg, are the architects; Mr. S. C. Weiskopf, New York, the consulting engineer and designer of the structural steel, and James Stewart & Co., whose offices are in New York, Pittsburg, St. Louis and Baltimore, the general contractors and erectors.

The Cumberland Extension of the Western Maryland R. R.—III.

Third Division.—Until lately little work has been done on the lower six miles of the upper division just west of Paw-Paw, as the line very closely parallels the canal for the greater part of this distance, and the prosecution of the work during the navigation season was considered by the canal authorities to be liable to interfere with the movement of boats. Now that the railroad has acquired the interest of the State of Maryland in the canal and agreed with the trustees operating it, work is rapidly progressing. The building of the line will present no unusually serious difficulties where it parallels the canal along this part of the route, although much of it is similar in nature to that just above Sideling Hill Creek. The rocky hillsides are neither so steep nor so high as they are along that part of the work, however, and the material can doubtlessly be removed without much of it falling into the canal.

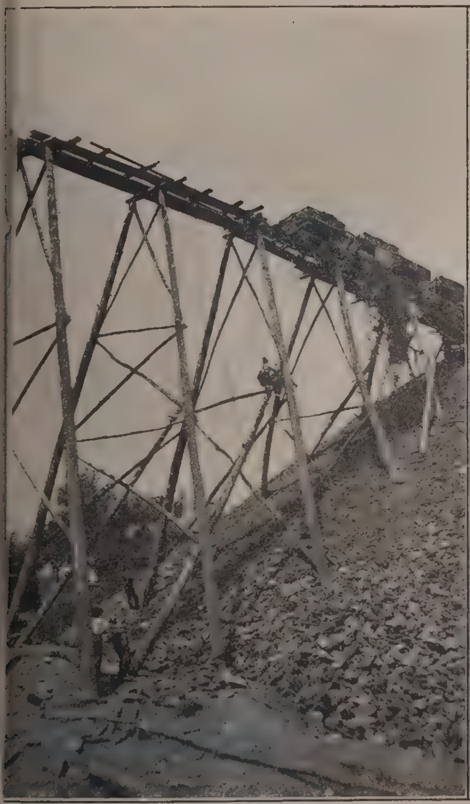


Early Work on Nuckols Cut, Showing Method of Removing Top Lift.

Above this canal work the grading has been pushed rapidly, and is finished at many points between here and the end of the division. The first difficult piece of work is a cut 2,000 ft. long and 60 ft. deep at the middle, containing about 110,000 cu. yd. of loose and solid rock. The material from it is being used in making a fill just beyond it, which is about 30 ft. high throughout its entire length of 3,000 ft. A cut requiring the excavation of 30,000 cu. yd. of loose rock follows this, after which, for a mile to Oldtown, the grading is light.

To avoid possible complications with the canal and the Baltimore & Ohio R. R., an interior line was considered from Sideling Hill Creek to Oldtown. A former survey, which was made with considerable detail, proved that the construction of a line over this route would require a 1.0 per cent. maximum grade ascending eastward, and 1.4 per cent. maximum grade ascending westward, as well as some 10 deg. curves. The physical characteristics of the route are such that the reduction of these grades or of the curvature could not be obtained without enormously increasing the conof onstruction, so such a route could not be cc idered.

ne track is to be carried on a fill about 3,500 ft ong, from just above Oldtown, to a small ci followed by a second long fill, extending ti . heavy rock cut. Beyond this cut the ma- t al for making a fill 1,500 ft. long and 75 ft. h 1 is being obtained from one of the most d cult pieces of rock excavation on the line k wn as Nuckols Cut. Although but 800 ft. i length, the edge of its side slopes are from 7 ft. to 110 ft. above the bottom of the cut, a . about 110,000 cu. yd. of material will have t be removed before it is finished. The point o the hill through which it is being driven is l gely made up of bowlders ranging in contents f m 3 to 30 cu. yd. These are scattered pro- n scuously and are very hard and dense. Much d ficulty has been experienced in drilling and b sting them, but the work has now reached a s ge where more rapid progress is being made. 65-ton Bucyrus steam shovel has recently been put in service, the early work having been done by hand and with dump cars.



Typical Temporary Pole Trestle.

Sixty-Foot Fill over Collier's Run.

With the exception of a length of about 4,000 ft., containing three cuts of considerable size, and a short fill 60 ft. high, the next three miles is comparatively light work. From this point to the end of the division there is some unusually heavy and expensive construction. The first four miles of this distance, although containing no bridges and few masonry structures, embrace several deep cuts and high fills. The line lies on the berme side of the canal, at varying distances from it, being carried in cuts through the rock hills along whose base the canal was built. These hills are short and steep and are separated by deep, narrow gulches, requiring the moving of large quantities of material to reduce the grades to the established maximum. The majority of the cuts are through solid rock, overlaid with a disintegrated formation. The fills have all been made by dumping from narrow-guage cars on pole trestles, which, in most cases, were built the full height of the fill, being erected ahead of it as it progressed.

Heavy Work.—A narrow valley, known as Martin's Run, required a fill 80 ft. high, 700 ft. long and 140 ft. wide at the base, containing 90,000 cu. yd. of material. A part of this was obtained from a cut below it, containing 35,000 cu. yd. of solid rock, while the remainder was brought from a cut just beyond it, lying close to the canal. A 10-ft. concrete arch provides a waterway for the drainage of the valley. A rocky point projecting out from the hillside about 4,000 ft. beyond this fill had to be removed to a depth of 65 ft. for nearly 800 ft., requiring 36,000 cu. yd. of difficult rock excavation.

In the next 3,000 ft. beyond that are two fills, each 500 ft. in length, containing 48,000 cu. yd. and 50,000 cu. yd. respectively, and a double-track cut 1,000 ft. long, from which 66,000 cu. yd. of loose and solid rock was removed. The fill over Collier's Run, just beyond this double-track cut, is 60 ft. high and 600 ft. long, containing 90,000 cu. yd. of material. This fill was all obtained from the cuts at either end. The cut at the west end was made through shale and loose rock and contained 50,000 cu. yd. Beyond this cut is a fill 65 ft. high, 175 ft. wide at the base and 400 ft. long, containing, approximately, 45,000 cu. yd. A solid rock ledge, rising 60 ft. above the track level at the west end of this fill, extended so far over the site of the line that it had to be passed through in a thorough cut. The rock in this ledge was extremely hard and considerable difficulty was experienced in removing it. The cut was worked in successive lifts of about 30 ft. each until it had nearly reached the bottom, when it was worked from the face to grade. This cut and the work beyond it for nearly a mile lies about 75 ft. above the canal and from 50 to 60 ft. from it on the berme side. A highway was located between the railroad site and the canal, and as it could not be placed above the tracks, owing to the abruptness of the hillside, it had to be relocated, and in many places is built on a bench extending out almost over the canal.

From about two miles below Oldtown, where the work is now being rapidly carried on, to the end of the work over the canal at the point just mentioned, in length of a little more than 9 miles, it will be necessary to move nearly 100,000 cu. yd. of material to the mile to finish the grading. Owing to the nature and location of the material which has to be handled, the extensive use of machinery has not been feasible, but it has been employed wherever possible. Ingersoll-Sergeant steam drills have been used in making the blast holes. Two 65-ton Marion steam shovels, a 70-ton Vulcan steam shovel, and a Bucyrus shovel with a 2-yd. bucket have been worked in different cuts. Narrow-gauge railway tracks have been laid in most cases, and small Porter engines and Western dump cars are used to remove the spoil. The large cuts and fills are so located that little overhaul had been required, and no serious problem has been encountered in disposing of the waste from the cuts. The large fills, without exception, have been made by dumping from temporary pole trestles, which were erected as the work advanced, the fill being brought to full height as it progressed.

The line continues from this side hill work above the canal, across the valley of the Potomac River, passing over the Baltimore & Ohio R. R. at North Branch, then through a heavy cut to a bridge over the canal, on across the valley of the river a second time to the seventh river crossing, and from it to the Welton Tunnel. The extreme flood height of the river is about 28 ft. above the bed of the stream along this part of it. A clearance of 22 ft. was required at the railroad crossing, and sufficient elevation had to be obtained in the valley to carry the track high enough on the side hill above the canal to provide room for construction. These requirements necessitated the moving of tremendous quantities of material. In a distance of 2.65 miles across the valley, approximately 590,000 cu. yd. of grading work, an average of about 42 cu. yd. to the lineal ft. of track, will be done before the construction work is completed.

A fill 4,000 ft. long and 50 ft. high at the center is at the east end of this valley. It contains 190,000 cu. yd., the material in it being obtained from the cut just below it and from the one just beyond it. The latter is 2,500 ft. long and contained 80,000 cu. yd. of solid and loose rock. The track is carried over the canal just beyond it on a deck-girder span of 85 ft. From the end of this bridge to the approach to the tunnel is a fill nearly a mile long, with an average height of 25 ft. The 260,000 cu. yd. of earth which were required to make this have been obtained for the most part from borrow pits on either side of it, although about 700 ft. at the west end, beyond the river bridge at that point, was made with the material taken out of the tunnel approach. A 65-ton Bucyrus steam shovel was used in the cut, while a Bucyrus shovel, with a 2-yd. bucket, excavated the material from the borrow pits.

Seventh River Crossing.—The seventh river crossing at the west end of this fill is the first of the three bridges which span the North Branch of the Potomac River, the South Branch coming in some distance below it. It is composed of four deck plate-girder spans, supported on three river piers, and an abutment at either end. The shore spans are each 95 ft. 7 in. long, and the channel spans are 95 ft. 6 in. long, making the total length of the bridge 382 ft. 2 in. These foundations are of the same general design as those of the bridges on the main stream farther down. The east abutment has a total height of 35 ft. 3 15-16 in. of which 11 ft. 6 15-16 in. is parapet wall above the bridge seat. The back of this wall has three 10-in. steps, 3 ft. high, near its top, which is 2 ft. wide. The wing walls are 2 ft. wide on top and extend 18 ft. 9 in. back from the front face of the back wall, which is 4 ft. 6 in. thick. They also have three steps, each 3 ft. high, in their back faces, but with 1-ft. offsets. The wall under the bridge seat is 3 ft. 3 in. thick, with a 12-in offset 4 ft. above the bottom. The west abutment is of the same dimensions, except that it is 8 in. shorter. The piers are 31 ft. 3 in. in height above the footings, which are on rock and vary in depth from 1 to 4 ft. 6 in. They are 30 ft. 2 in.x6 ft. 6 in. in plan at the lower edge of the coping. The foundations contain a total of 2,000 cu. yd. of concrete.

Welton Tunnel.—The approach to Welton Tunnel commences about 700 ft. west of this bridge, and is about 1,200 ft. long. Fifty-six thousand cubic yards of rock were removed to make the approach to it. A heading 8 ft. deep and the shape of arch was taken out first, the remainder of the section being removed in two lifts, each 8 ft. deep. The tunnel has a total length of 700 ft., its west portal being directly over the river, in the vertical face of the hill through which it passes. This face rises about 300 ft. on an almost perpendicular slope from the water's edge, so considerable difficulty was experienced in starting the heading at that end. The grade at the portal is about 45 ft. above the bottom of the river, and, as a temporary pole trestle across the river was liable to be frequently washed out by the sudden floods to which the river is subject, some other method of carrying on the work had to be devised. A rope ladder was suspended from the top of the hill to the site of the heading. Men descended on this and excavated a bench in the face of the rock large enough to permit an Ingersoll-Sergeant steam drill to be set up. Blast holes were then made, charges placed in them and the material loosened and removed to a depth of several feet.

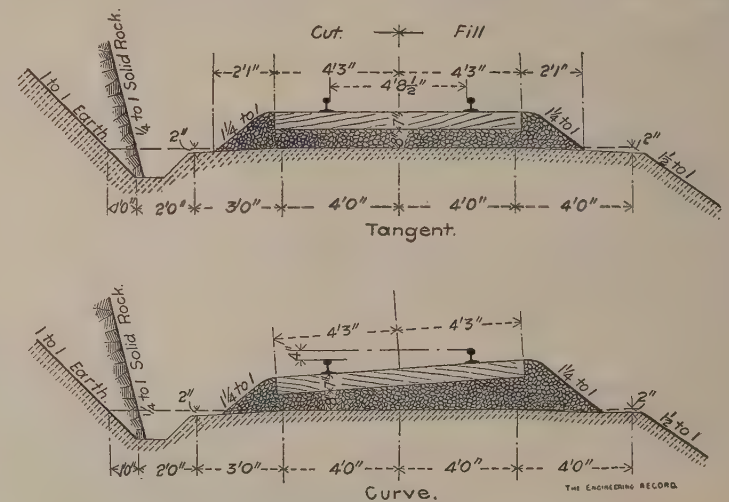
A Lidgerwood traveling cableway, with a 900-ft. span, and a 3-ton capacity was then erected across the river. The tall tower was placed on top of the hill over the portal, as there was no location for it on the hillside. The 70-ft. head tower was erected across the river, about 500 ft. from the west bank. A special 9x10-in. double cylinder Lidgerwood engine, with double 41-in. hoisting drums, was placed in an engine house near it. The excavated material from the tunnel was placed in skips on narrow-gauge flat cars and brought to the portal. These skips were elevated and carried across the river by the cableway, the material being used in making a fill on that side.

Eighth River Crossing.—This cableway was also used in building the bridge masonry The concrete mixing plant was set near the head tower and the concrete conveyed into place in the forms by skips on the cableway.

A 2-yd. K. & G. cubical mixer was used in mixing the concrete, the batches being made in varying quantities to meet the requirements. These foundations are very similar to those for the bridge just below the tunnel. The piers are each 30 ft. high above their footings; their other dimensions approach very closely those of the piers under the bridge just mentioned. The west abutment is of the same design as the corresponding one on that bridge, while a shelf had to be excavated in the solid rock on the east side before the bridge seat and parapet wall could be erected there. The total length of the bridge is 382 ft. 2 in., the same as that of bridge 7, of which it is a duplicate.

Ninth River Crossing.—The line curves to the left from the end of this bridge, and, crossing the canal twice in the next three-quarters of a mile, passes over the ninth and last river crossing into a tunnel through Knobley Mountain. The canal bridges are each to be 85-ft. plate-girder spans, supported on concrete abutments. The ninth river crossing is of the same length and design as the seventh and eighth ones. It has foundations in every way similar to those built for these bridges, except that the east abutment is 27 ft. 6¼ in. high, and the west one 31 ft. 6 5-16 in. high. As the fill on the east of this bridge might have caused some damage by backing up an exceptionally high flood, the channel of the river was considerably deepened and widened between the bridge abutments.

Knobley Tunnel.—The east portal of Knobley Tunnel is about 200 ft. from the west end of this bridge. The approach to it was cut through the steep rock side of the mountain on the face of which the west bridge abutment was built. This tunnel is 1,400 ft. in length and is the only one of the five that have been driven that has required timbering during construction; in fact, the work on this was also done without timbering, with the exception of 100 ft. of it at the west end. The west approach is about 900 ft. long, 40 ft. deep and contains 63,000 cu. yd. It was cut through a stratum of loose clay with considerable quantities of small boulders and some sand pockets. The west portal and the first 100 ft. of the tunnel were made through this same material, in which much difficulty was experienced in holding the heading to form while it was being taken out.



Standard Track Sections.

The cutting other than this was through rock through which fair progress could be made. A ledge was encountered near the center, which was unusually dense and required, in some cases, five blasts to loosen a section of it. The tunnel was taken out in three sections, a top heading the size of the arch was first driven entirely through. Two lifts of 8 ft. each were then taken out and the trimming of the section completed. The tunnel was completed in 10 months after work was begun on it, a day and a night shift being employed.

A compressor plant containing two 24x30-in. Ingersoll-Sergeant compressors was installed about 1,000 ft. west of the west portal. It supplied air to operate the Ingersoll-Sergeant drills which were used in making the blast holes and also for a 45-ton Vulcan shovel which was used in the tunnel to excavate and place the material loosened by the blast in dump cars. The material from the west end was used in making a fill beyond the west approach. That from the east end was dumped on a spoil bank along the bank of the river until the bridge foundations were finished, when the cars were run across the temporary pole trestle built over the bridge site and dumped on a fill across the river bottom.

A short distance beyond the west tunnel approach the line joins the main line of the West Virginia Central, about 1½ miles below its terminus in Cumberland.

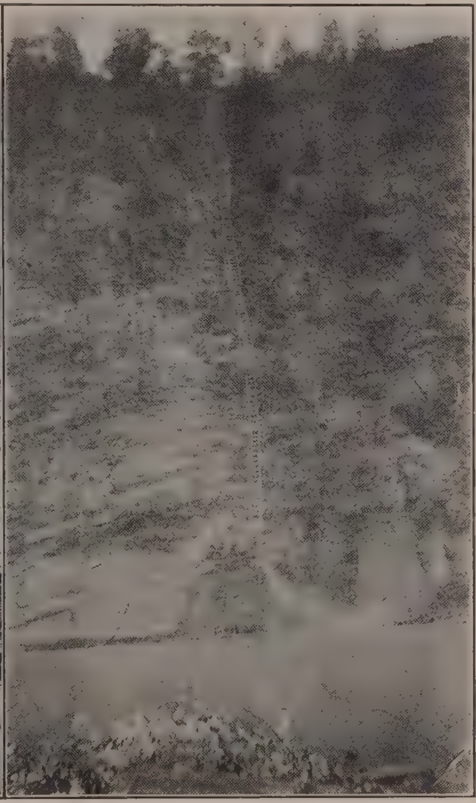
Comparison of Routes.—Six alternative lines were surveyed between Cumberland and the crossing of the Baltimore & Ohio R. R., just east of Welton Tunnel, in an endeavor to determine the most feasible route both from a standpoint of construction cost and from that of economical operation. Four of these lines pass to the north around the base of Knobley Mountain, one of them crossing the river twice and entering a tunnel near Welton Tunnel. The other three were carried along the south bank of the river, following the base of the mountain and joining the other line at the tunnel. The two remaining lines cut out about 1½ miles of distance by passing through Knobley Mountain. One turned at the east end of the tunnel and followed the river bank along the route of the three other lines to the Welton Tunnel. The second of these two lines is the one constructed.

In comparing these lines it was found that for any traffic up to 13,000,000 tons per mile per year, the three lines around the base of the mountain, crossing the river but once, ranked first, second and third, their relative values being approximately the same. For a traffic above that amount, the line passing through Knobley Mountain and following the river along the base of the mountain through which Welton Tunnel is driven to a tunnel site near that tunneled was justifiable. Neither the line around the north end of Knobley Mountain, which crossed the river twice, nor the tunnel line through it, also requiring two river bridges, could be considered until a traffic of 40,000,000 tons per mile per year is reached. The most expensive of these lines, however, the tunnel line crossing the river twice, was built. It is not only 1½ miles shorter than all the other lines, except one, but it brings the manufacturing interests in South Cumbebrland tributary to the road. The additional profits from the freight traffic of the old industries located there and from new ones were believed to be sufficient to justify the choice of this line.

In comparing the alternative routes between these points and alternative lines between other points, the best and most economical line was considered to be the one whose operating cost, plus interest on the cost of construction, is a-minimum for any given traffic movement. The cost of operation was taken at $1.10 per train mile, based on the average cost of $1.07 per train mile for all the railroads in the United States, and a cost of from .90 to $1.50 per train mile on the coal-carrying roads. When comparing differences in distance, however, the shortening of the distance a mile or two was held to have little or no effect on station, terminal, switching or general expenses. On the other hand, rail and tie renewals, maintenance and track labor, ballast and fuel were counted as varying almost directly with the distance, while motive power, oil, water, waste, car repairs, etc., as being only partly affected by minor distance.

For comparative purposes, moderate changes of distance, such as are under consideration here, were taken as costing from 60 to 64 cents per train mile, and excess of curvature as being worth from 6 to 10 cents per train mile. Thus, 70 cents per train mile was taken as a basis of computation, not as an absolute value of train mileage as a whole, but as a representative value of minor changes, in order to render the comparisons reliable. Up to 9,000,000 tons per mile per year the road was considered to be a single-track road, while above that amount of traffic it was estimated as double track, with construction cost increased 50 per cent. over that of a single-track line.

East Heading of Knobley Tunnel.



Site of West Heading of Welton Tunnel.

The route selected for the portion of the line just mentioned is the only one over which a traffic greatly exceeding that of 18,000,000 tons per year is required before its construction was justified from a comparative standpoint with other routes. The line accepted from the east end of the third river crossing to a point just west of the sixth river crossing ranked third among the possible routes for any traffic up to 12,000,000 tons, and second even at 18,000,000 tons. It was accepted, however, on account of the physical constructive difficulties, and the liability of legal complications which were attendant upont the alternative routes.

General Features of Construction.—There have been many difficulties encountered in the prosecution of the construction, which have not only increased the cost of the work, but have also caused a great amount of inconvenience to those who carried it on. On the other hand, several conditions have been present which, in no small degree, facilitated the work and permitted unusual methods to be followed at different places in it. The tunnels have thus far been driven without timbering, except for a length of 100 ft. at the west end of Knobley Tunnel. The pier foundations for the bridges have all been built on solid rock, which was found at a depth of a few feet below the stream bed, except in the case of one pier at Sideling Hill Creek, where excavation had to be carried to a depth of 14 ft. No piling has been required under any of the foundations, except in the case of a few of the small pedestals under the towers of the steel viaducts and under one pier. The canal has permitted the easy and economical handling of materials used in construction on the greater part of the line, and has also afforded a ready means of transportation for the heavy grading machinery used at different points.

The grading was done for the greater part, in the season of 1904, specially on the middle and upper divisions, where the majority of the work was required. The unusual freedom of the summer and fall from rain permitted rapid progress to be made, and the heaviest portions are about completed. The work has been pushed with the greatest possible speed, having been carried on both night and day in the tunnels and on the grading at various points.

The road-bed, when finished and properly settled, is required to conform to the grade levels and elevation for curves set for it, and is usually of the following dimensions: On embankments, 16 ft. wide; in earth excavation, width of cutting at the base, 20 ft.; width of road-bed, 14 ft., and width of side ditches at the top, 3 ft.; in rock excavation, width of cutting at the base, 18 ft., with a road-bed 14 ft. wide and side ditches 2 ft. wide on top. Where cuts are liable to be filled with snow or for other reasons, these widths are increased. When providing for double track, 12½ ft. is usually added to these dimensions. The slopes of all earth embankments are 1½ to 1, and of rock embankments, 1¼ to 1, unless required to be changed by local conditions. Earth excavations, side ditches and channels have slopes of from 1 to 1 to 1½ to 1 depending upon the material in which they are made, while the sides of solid rock excavations are finished with slopes of from ⅛ to 1 to ½ to 1, and those of loose rock excavation, from ¼ to 1, to 1 to 1.

Concrete.—The masonry in practically all cases is of concrete. Two mixtures have been used, depending upon the character of the structure which is to be built. In proportioning these mixtures the governing unit has been held to be 1 barrel of Portland cement, 4 sacks being considered its equivalent, in a moderately loose condition and measuring 3⅔ cu. ft. The first mixture is made in the proportions of 1 part cement, 3 parts sand and 6 parts broken stone. It is generally used in all parts of arch culverts under 8 ft. spans; in the footings and bench walks of arch culverts of 8 ft. span or over, and in bridge abutments below the coping. The other mixture is made in the proportions of 1 part Portland cement, 2½ parts sand and 5 parts broken stone. This is used in the arch ring of culverts of 8 ft. span or more; for the coping and the back walls above the coping on bridge abutments, and for all parts of bridge piers.

These proportions between sand and stone are based on the stone being comparatively free from sand and fine screenings, but as the crusher-run of broken stone has been used in most of the concrete on this work, allowance has been made for the fine material. Enough of the product of each crusher, when working on a particular kind of stone, has been screened to determine the percentage of fine material in it and the amount of sand in the mixture has been reduced accordingly, the stone being increased by a corresponding amount.

Three brands of cement, Lehigh, Alpha and Dragon have been principally used, athough other brands have been substituted in a few instances. The sand is obtained near the work, and for the most part has been clean, sharp river sand. The broken stone has been largely obtained from the rock excavations and the tunnel work. The greater part of that which has been used is a bluish-gray limestone, which is quite dense. The mixing has been done almost exclusively by machine mixers, a mixture sufficiently wet to allow the method of placing it required by the following specifications: "The concrete will be moderately rammed in 12-in. layers or less, and spaded to insure the filling of all voids; a smooth face will be obtained by working a spade or fork between the form boards and the concrete on all exposed surfaces; no separate facing, and no plastering will be allowed, and when the forms are removed a smooth surface, free from voids, will be required. Beveled or rounded corners will be made on all exposed angles by introducing the proper triangular strips or round-corner moulding pieces within the forms. The form boards used on all exposed surfaces shall be of dressed lumber and closely fitted in order to secure the best results in appearance and surface of the finished work."

The concrete work on bridges 5 and 6 was done by Woods & Hamilton. The remainder of the concrete work on the upper divisions was, with slight exception, done by Winston & Co. & Locher.

Requirements for Tunnels.—The following specifications are being followed in driving and lining the tunnels: "The normal cross-section for single-track tunnels will be 17 ft. wide between perpendicular side walls, 22½ ft. high above sub-grade, and 1 ft. below sub-grade. The curve of the arch will be a semi-circle, whose springing lines shall be 14 ft. above sub-grade. The normal cross-section will contain 368.4 sq. ft., equaling 13.65 cu. yd. per lineal foot of tunnel. If timber lining is employed the sections will be enlarged and measured to a line 3 in. outside of such timber or lagging on side walls and arch, and if masonry lining is employed, sections will be enlarged to a line 6 in. outside of exterior lines of side walls and arch. The price paid for excavation includes the cost of temporary supports, shores, scaffolds, etc., that may be necessary for the safe prosecution of the work in advance of the introduction of permanent supports of timbering or masonry, and all such temporary timbering shall be removed by the contractor upon the completion of the permanent supports.

"Drilling and blasting must be conducted with care, so as not to shatter the roof and sides outside the prescribed section, and if any falls occur that in the opinion of the engineer are attributable to carelessness or want of proper attention on the part of the contractor they shall be removed and disposed of at his own expense; but if by unavoidable accident or natural causes, outside rock shall become loose or shattered, it shall be removed by the contractor on a just and equitable allowance made him by the engineer as compensation for such removal. The price paid for tunnel excavation will be understood to cover and pay for the entire expenses of its removal and transportation to the designated place of deposit provided the haul of such material does not exceed 800 ft. outside of the tunnel portals, and beyond that distance the price for overhaul (1 cent per cu. yd. per 100 ft.) shall be paid.

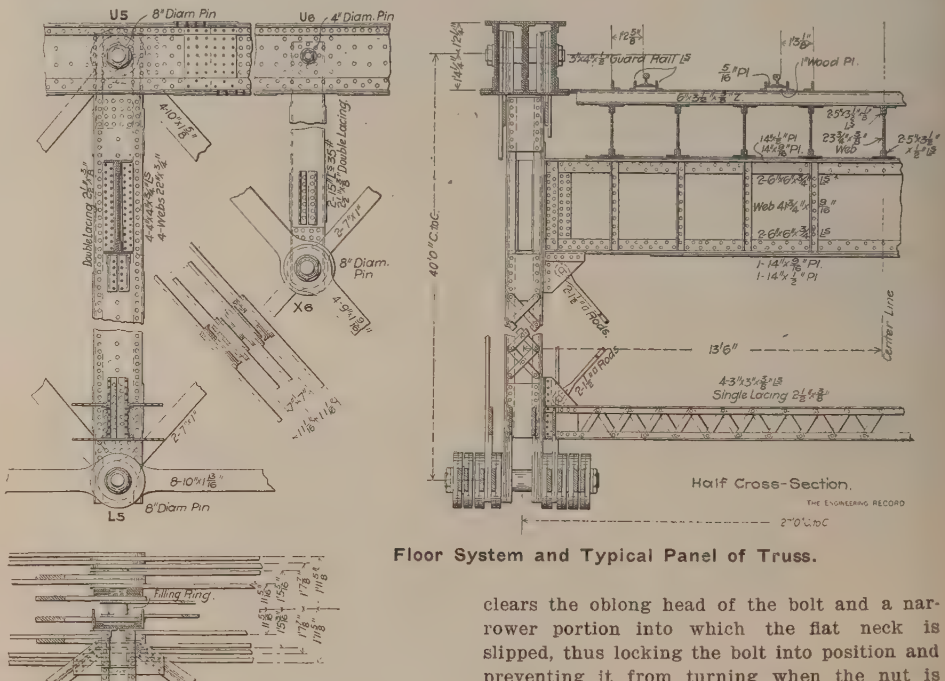
"The location, extent, kind and plan of all tunnel lining shall be as directed by the engineer. Timber lining will ordinarily consist of 12x12-in. posts for side walls spaced 4 ft. centers or as may be necessary, with either longitudinal or cross sills, or both, as may be required, and either with or without wall plates as may be determined. The arch will usually consist of five segments of 12x12-in. timbers placed over each pair of posts. The lagging will usually be 4 in. in thickness. All timbers to be of oak or yellow pine or such other timber as may be approved by the engineer; it will be bid for separately, and paid for by the thousand feet B. M. for the amount left standing permanently in the work.

"The vacancies behind the timber lagging or masonry walls, and above the arching must be filled with concrete or dry packing, or rubble or brick masonry as the engineer may from time to time direct. Dry packing or rubble must be of hard durable stone and well rammed in; a price shall be bid for dry packing, but other forms of packing shall be classified under the several heads of masonry in tunnels; the packing that may be required to fill falls or voids attributable to want of care on the part of the contractor shall be placed by him, of the kind and in the manner directed by the engineer, and free of cost to the railroad company."

Mr. J. Q. Barlow, M. Am. Soc. C. E., is chief engineer of the Western Maryland R. R., and is personally directing this work. Mr. C. I. Bosworth is bridge engineer and has supervision of the field work on all the bridge masonry and bridge superstructure erection. The three divisions are each in charge of a division engineer, who, in turn, has three resident engineers under him, with a complete engineering party on each residency. Mr. John Carmichael is engineer of the lower division, Mr. G. W. Forrey of the middle division, and Mr. F. A. Parsons of the upper division. Mr. V. G. Bogue, M. Am. Soc. C. E., of New York, is consulting engineer for the company.

A Double-Track, Pin-Connected Railroad Bridge with Stringer and Solid-Plate Flooring.

The two tracks of the Chicago, Milwaukee & St. Paul Railway cross the Mississippi River at Minneapolis, Minn., on a three-span deck bridge with a clear headway of 70 ft. above high water. It has two new masonry river piers about 100 ft. high which are located 27 ft. from the centers of two old masonry piers about 25 ft. high, with their tops at high-water level, which formerly supported towers carrying the channel spans of the old bridge at a clear height of 76 ft. above high water. The new structure was built and the old one removed without interfering with the continuous train service. The total length of the bridge is about 1,070 ft. from out to out, and includes one 288-ft. and one 324-ft. and one 234-ft. main spans, one 30, two 60-ft. and one 65-ft. plate-girder approach spans.



Floor System and Typical Panel of Truss.

The main spans have two lines of pin-connected Pratt trusses 40 ft. deep and 27 ft. apart on centers. The 288-ft. span has eight 36-ft. main panels with sub-verticals supporting the center points of the top-chord sections. Most of the details and connections conform to ordinary standard practice. The top chord of the 324-ft. span is 30½ in. deep and 36 in. wide, and has three webs throughout, except in the end panels, which have only two. The maximum cross-section is composed of one 36x⅞-in. cover-plate, six 30x⅝-in. web-plates, four 4x4x¾-in. and two 6x4x¾-in. flange angles, two 6x6x¾-in. lower flange angles, one 7¾x⅜-in. and one 4¾x⅜-in. flange plates. It is made in single-panel sections with field-riveted splices 3½ ft. beyond the panel points. The maximum bottom-chord section consists of eight 10x2⅛-in. eye-bars and the chord pins at main panel points are from 7¼ to 9 in. in diameter. Those at the upper ends of the sub-verticals are 4 in. in diameter.

The 42-in. floorbeams are web-connected to the vertical posts opposite the diaphragms in the latter and are seated on solid-web knee-brackets which receive the pin connections for the sway-brace rods. The stringers are seated directly across the top flanges of the floor-beams, and their upper flanges support 6x3½x⅜-in. transverse Z-bars about 24 ft. long and 18 in. apart on centers. The lower flanges of these bars are riveted to the stringers and the upper flanges are riveted to a continuous floor plate ⅜ in. thick, which projects beyond the ends of the Z-bars and just clears the lower flanges of the top chords. The outer edges of this plate are riveted to the projecting edges of the special lower flange reinforcement plates of the top chords, thus making a watertight platform occupying the entire space between the top chords. Pairs of 3x4x½-in. longitudinal angles 9 in. apart back to back, are riveted to the floor plates and between them are laid 2x8¾-in. continuous wooden cushion pieces. These are covered by continuous 8¾x5/16-in. steel plates on which the rails are seated. The rails are held by beveled washers engaging their flanges and secured by vertical bolts passing through the plates, cushions and floor plates.

The floor plates are punched with keyhole-shape holes having a circular portion which clears the oblong head of the bolt and a narrower portion into which the flat neck is slipped, thus locking the bolt into position and preventing it from turning when the nut is screwed up. There is no transverse bracing between the stringers and no lateral bracing for the top chords, the solid floor being considered to provide for all transverse stresses in the upper part of the bridge. The lower-lateral system consists of the bottom transverse struts, as shown in the cross-section, and of I-shape diagonals made with pairs of angles back to back latticed. The depth of these struts is uniform with that of the transverse struts and they are field-riveted between horizontal connection plates like jaws, which project beyond the top and bottom flanges of the transverse struts.

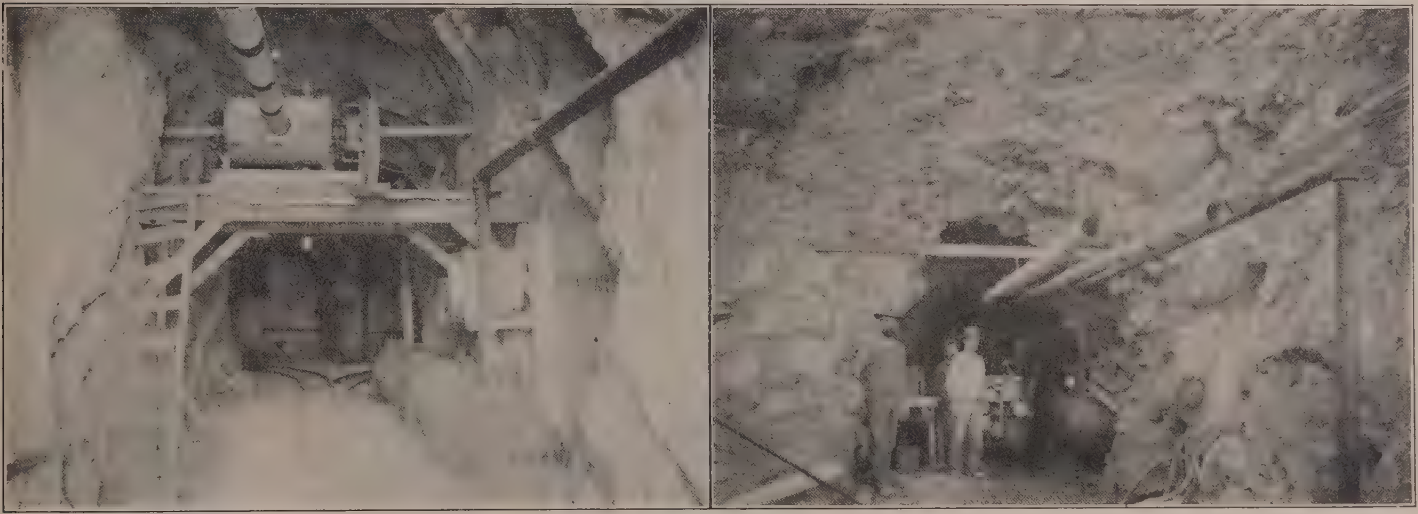
The superstructure weighs 6,576,817 lb., including 975,330 lb. for the girder spans, and was erected on pile falsework. It was designed by the Engineering Department of the Chicago, Milwaukee & St. Paul Railway, Mr. Don J. Whittemore, chief engineer; Mr. Onward Bates, engineer and superintendent of bridges and buildings; and Mr. Albert F. Reichmann, assistant engineer at the time of its construction. The Bridge and Building Department of the railway company built the substructure, and the American Bridge Co. was the contractor for the superstructure.

The Power Plants of the Edison Electric Company of Los Angeles.—III.

Power Plants Located on the Kern River.—The drainage basin of the Kern River, above the intake of the Edison Electric Co.'s Power Plant No. 1, is approximately 2,000 square miles. Its elevation ranges from about 1,000 ft. at the location of Power Plant No. 1 to 14,522 ft. on the summit of Mt. Whitney. There are several high peaks at the head waters of the Kern River, whose altitude is between 13,000 and 15,000 ft. The length of the river from the mouth of the canyon, which is less than two miles below Power House No. 1 to the uppermost intake, that of its power plant No. 6, is approximately 160 miles. The distances and amounts of fall in the stream for each of the proposed power plants is given in the accompanying table.

Table of Power Development of the Kern River.

Name of power plant.	Length of steam diverted, miles.	Total fall so diverted, feet.
Power Transit & Light Co.	2	236
Power plant No. 1.	12.5	939
Power plant No. 2	15	409
Kern River Co.	15	263
Power plant No. 3.	20	856
" " " 4.	30	1,042
" " " 5.	35	1,322
" " " 6.	30.5	1,000
Total	160.0	6.067



Adit Openings between No. 14 and No. 15 and between No. 15 and No. 16 Tunnels, Kern River Plant.

The plant of the Power, Transit & Light Co. of Bakersfield, Cal., which is the subject of one of the half-tone engravings, has a net fall for power purposes of 206 ft., and a length of conduit equal to about 1¾ miles, all of which is tunnel. The water supply for this plant is the same as that for Power Plants Nos. 1 and 2 of the Edison Company, as it is located on the main stream of the Kern River near the mouth of the canyon. The minimum flow is approximately 200 sec. ft., and the capacity of the conduit is stated to be about 400 sec. ft. There is now machinery installed for approximately 2,000 h.-p., which is not quite sufficient to utilize all of the flow at the minimum stage of the river.

The Kern River Co.'s plant will have a net fall from the forebay to the power-house floor of about 227 ft., and a gros fall of 251 ft., the 24 ft. difference being utilized by means of draught tubes. This plant does not obtain the entire flow of Kern River at its maximum point, since it diverts from the North Fork above the junction with the South Fork of the river. The line of this power conduit is approximately 12.65 miles long, and consists principally of open earth canal, there being some flumes and tunnels. Based upon the amount of water in the stream, the output of this plant will be, at times of minimum flow, about 2,000 h.-p., and during times of maximum flow about 8,000 h.-p. The Kern River Co. is allied with the Pacific Light & Power Co. of Los Angeles, and the power is to be transmitted to that city and utilized principally by the Huntington railway systems. The 125-mile double-pole line is completed.

The Edison Electric Co. owns the water rights comprised in the six plants and has plans more or less defined for a minimum development of 87,696 h.-p. on the Kern River, while the full capacity of the plants, which, it is stated, could be obtained during the entire year, with the exception of a few weeks between August and October, is over 160,000 h.-p. Added to the present and prospective plants in San Bernardino and Los Angeles counties, the ultimate generating capacity of the company's plants, including one steam station, is found to be 185,000 h.-p. At present the company is engaged in constructing Plant No. 1 and merely building roads and trails to the sites of other plants.

Kern River Plant No. 1.—The general plan for Kern River Plant No. 1 includes the diversion of the water about 15 miles from the mouth of the canyon by means of a concrete dam, carrying it down a gravity conduit consisting almost entirely of a series of tunnels to a small forebay and dropping it through an inclined pressure tunnel to the power house, which will be located on solid bed rock on the river bank directly opposite the intake tunnel of the Power, Transit & Light Co.'s plant. The total length of the gravity conduit will be about 8.8 miles, a saving of about 4 miles in the length of the stream. On the gravity conduit there will be 19 tunnels, only very short flumes being used between tunnels in crossing ravines.

The diverting dam at the head of the conduit line will be of concrete and natural granite, and will be about 20 ft. high and 100 ft. long. It will back up water for a distance of about 1¼ miles. For sluicing the reservoir there is a special tunnel 365 ft. in length, which is located below the level of the foundation of the dam. This tunnel will drain the reservoir at a point some distance above the intake tunnel and will discharge into the river below the dam.

An important feature of this drainage tunnel will be a hydraulically-operated gate, the design of which is illustrated herewith in detail. The gate will be 9 ft. wide and 9 ft. high, the size of the tunnel section, and will be built up horizontally of eight 12-in. I-beams, weighing 40 lb. per foot, strengthened vertically by 4x5-in. T-irons, weighing 12 lb. per foot. The whole will be supported by two 15-in. vertical I-beams weighing 60 lb. per foot. The gate operates in cast-iron guides, rolling at each side over four bronze rollers 3½ in. in diameter and 3 in. long. There will be two hydraulic cylinders, each 11 ft. 9½ in. long over all, and with an inside diameter of 32 in., the lining being of brass 3/16 in. thick. The cylinders are built for 200 lb. pressure and will be operated by means of a four-way bronze valve connected with the cylinder ends by 2½-in. extra strong wrought-iron pipe. The piston rods will be 6 in. in diameter and 30 ft. 7½ in. long, and will be constructed of bronze or wrought iron sheathed with ⅛ in. brass. They operate through a shaft 40 ft. high and 9 ft. square on the inside, and are built of concrete with 3-ft. walls. Other details of the gate, such as the steel equalizing shaft, pinions, rack, the shaft bearing, guides, etc., may be observed in the drawing.

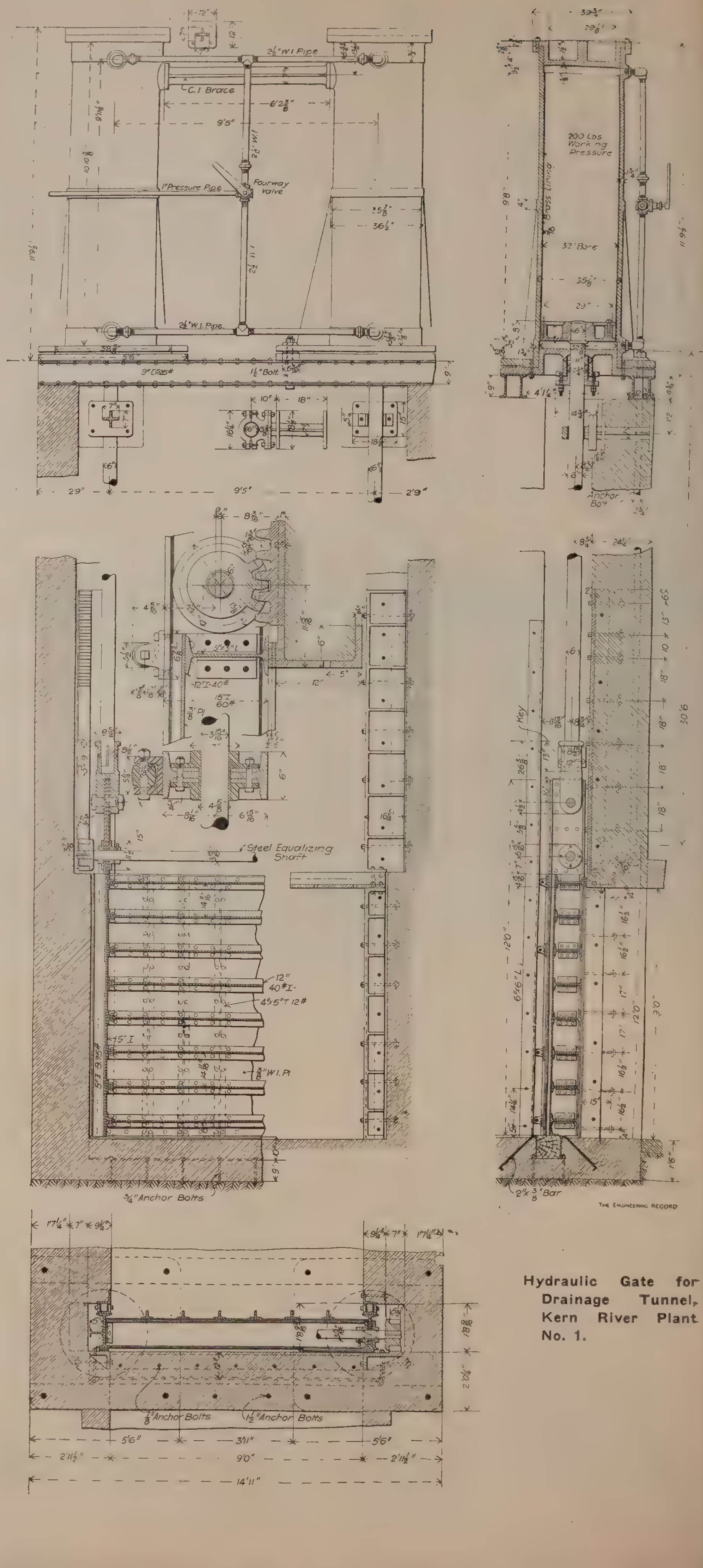
The water for the gravity conduit will be taken from the dam through regulating gates and enter a 595-ft. tunnel. The total length of the tunnels is 44,945 ft., and about one-half of this distance, at the time of writing, had been excavated. This work has been carried on in all of the tunnels, and some of them are completed. The reason for dividing the tunnel work up into a number of sections was because of the greater convenience of making the excavations. On each of the 20 gravity tunnels the work is being carried on from both ends, and on the pressure tunnel, from the lower end, so the entire work is divided among 41 headings. The number of openings will also be an advantage in patrolling the conduit after it is completed.

The tunnels are carried in as near a straight line as practicable, being brought to the surface in crossing short ravines or by means of short adits. Where necessary to span the ravines between tunnels solid constructions will be used, consisting either of steel flumes built on stone and concrete or steel piers, or the entire work will be done in concrete. The total drop in the gravity line is 66.5 ft., or about 7½ ft. to the mile. The tunnels are being excavated to a width of 9 ft. and to a height of about 9 ft., as near as the nature of the material will allow. All sections will have 3 or 4 in. of concrete on the bottom and will be lined to a height of 7 ft. In places where the roof of the tunnel will not stand up it will be concreted over. In one or two of the tunnels considerable timbering has been necessary, and in those cases a standard bent is used. It is formed of 6x8-in. timber, the bents being placed about 4 ft. 6 in. apart. The timbers for one bent are packed for transportation on one mule to the point where they are needed. When completed the timbered sections will be entirely covered with concrete, the timbers being left in position. Two of the engravings show sections of the tunnel concrete lined and in solid rock. Probably not more than 1 per cent. of the entire length of tunnels will have to be timbered.

The lower end of Tunnel No. 19 is at the top of a spur of Mt. Breckenridge, overlooking the power-house site. Here an open forebay will probably be constructed by concreting in an artificial basin. From this forebay the pressure tunnel will be carried down at about an angle of 30 deg. with the horizontal until it strikes a horizontal tunnel that has its lower opening at the power-house site on the end of the river. This horizontal section, about 400 ft. in length, has been completed, and work is now progressing on the inclined tunnel. To construct the latter a small shaft about 3 ft. in diameter is being driven from the horizontal section to the top. When this is completed, work on the full size 9x9-ft. tunnel will be started at the top and carried downward, the small shaft being used to carry off the excavated material. When the tunnel is completed a steel pipe of sufficient size and strength to carry the full 400 sec. ft. of the gravity conduit will be laid in the tunnel and packed with concrete on all sides. The net head to be derived from the pressure pipe will be 872 ft., which will give 32,000 h.-p. with 400 sec. ft. of water. The foundation walls of the building will be of concrete, and are to be carried up high enough to raise the station floor above high-water mark.

In construction work, about the first work done consisted in building a good substantial road along the side of the river from the mouth of the canyon to the power-house site, or Camp No. 1. The cost of building this road was considerable, as much of it had to be blasted out of the walls of the canyon and a good deal of filling had to be done. The grade is about 2 per cent., and all sharp turns had to be avoided, as supplies and materials are hauled to the camp by six and eight-horse teams, which can pull only on easy curves. Six working camps were located on the main river between the power-house site and the intake. All materials and supplies for the camps above No. 1 have to be packed on mules and burros and carried over trails, which had to be built.

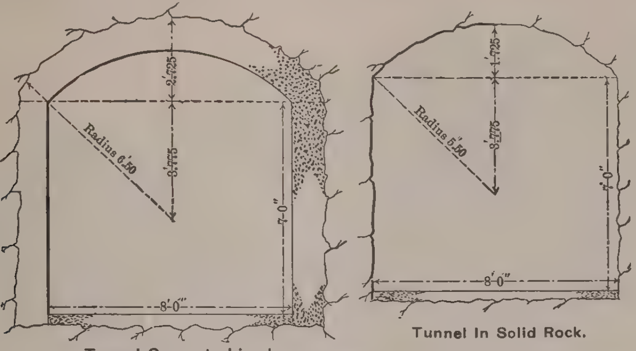
Excavation in the tunnels was done by hand drilling at first, but this method has now given place in most of the headings to air-drilling, the electric power for driving the air compressors being derived from a construction power plant installed last year. This plant is located near Camp No. 5, where a natural fall in the river of about 40 feet has been utilized. The station building is 26x58 ft. long, and is built of corrugated iron. There are two 250-h.-p. turbine wheels of the McCormick type, manufactured by the S. Morgan Smith Co. Each operating at 600 r.p.m. under a 50-ft. head, 10 ft. of which is taken up by the draft tube. Each wheel is direct-connected to a 150-kw. 2,300-volt three-phase 60-cycle General Electric alternator, and one wheel, in addition to its generator, drives by means of a belt a J. Hendy air compressor, the capacity of which is 600 cu. ft. of free air per minute. The rest of the equipment of the station includes three 75-kw. transformers for raising the machine voltage to that of



Hydraulic Gate for Drainage Tunnel, Kern River Plant No. 1.

the transmission line, 10,000 volts, and a two-panel switchboard, upon which are mounted the necessary switches and instruments.

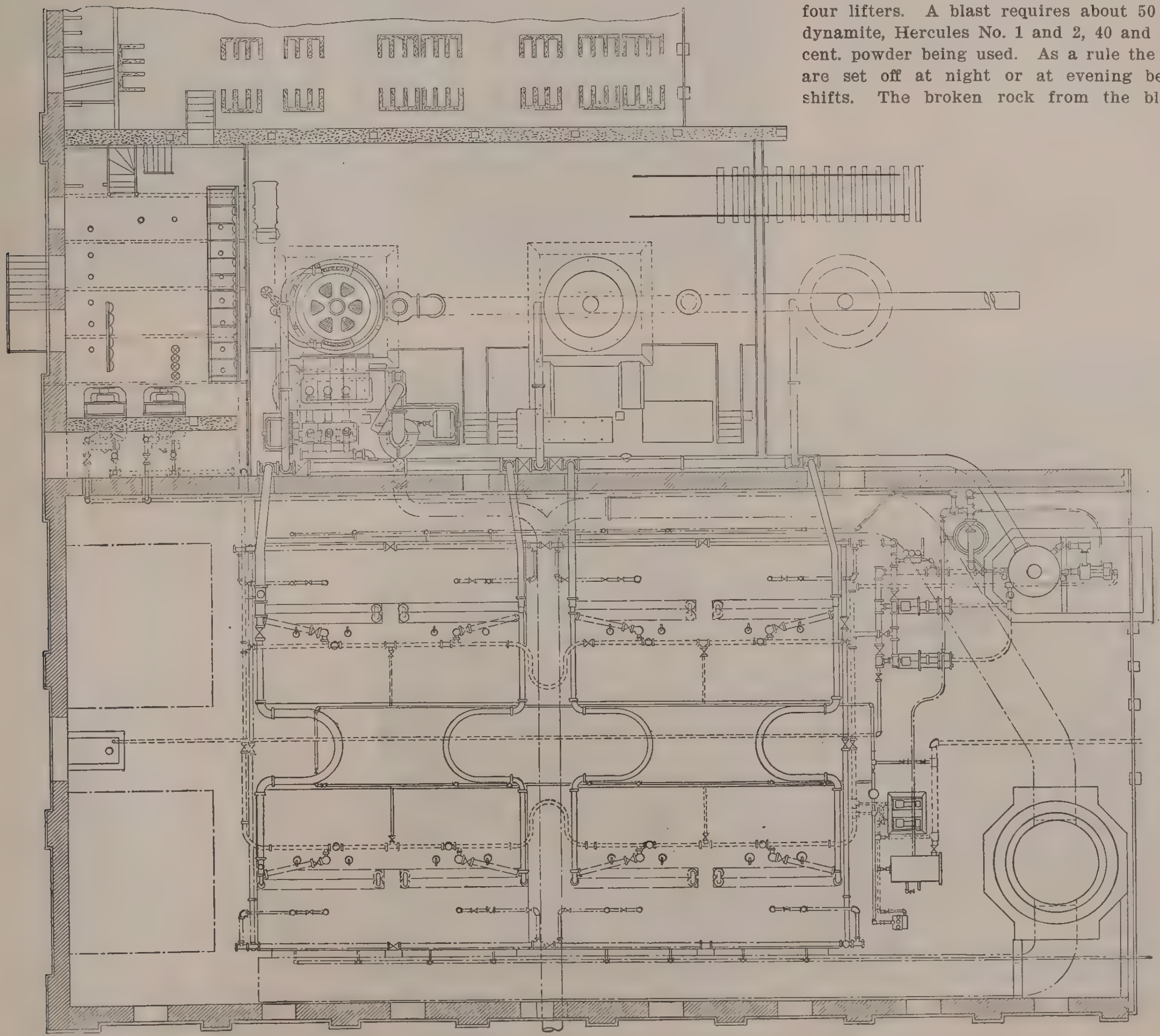
Power is transmitted four miles down the canyon to Camp. No. 1 at the generator voltage, 2,300 volts, and there used to drive three motors. The largest of these is 50 h.-p. and is belted to a Compressed Air & Machinery Co.'s 400-cu. ft. compressor; a 5-h.-p. motor operates the tools in the machine shop, and a 30-h.-p. motor is used to drive a Fulton Engine Works hoist operating a 1,800-ft. cable.



Tunnel Concrete Lined.

Tunnel In Solid Rock.

Tunnel Sections of Kern River No. 1 Plant.



General Plan of Los Angeles Station No. 3.

Power is transmitted up the canyon from the construction power plant to Camps Nos. 2, 3 and 4, the length of the 10,000-volt line being 11 miles. At each of these camps the power is stepped down to 2,300 volts and used for driving air compressors. At Camp 2 there are two 75-h.-p. motors driving compressors; at Camp 3 a 50-h.-p. motor is used; and at Camp 4 a single 75-h.-p. motor. At Camp No. 3 a 2,800-ft. Fulton hoist is directly driven by a 20-h.-p. motor. At Camp 2 two triplex pumps driven by 3-h.-p. motors are installed for raising, from the river, 500 ft. below, the water needed for cooling the cylinders of the compressors. At Camp 3 a similar triplex pump is used to raise water 350 ft. for a like purpose. At Camps 1 and 4 water is raised 100 ft. by means of steam pumps, which are operated by air furnished from the compressors.

The tunnel excavations are carried on with pneumatic drills. A pressure of from 80 to 90 lb. per square inch is carried on all the systems. At each tunnel opening the compressor pipe is connected to a receiver from which the pipes are carried along the floor of the tunnel to the face. Of the accompanying half-tones, one shows the receiver in the adit of lower No. 15 and upper No. 16, and another the equipment in the adit of lower No. 14 and upper No. 15. The former view shows a working party that has come out during a blast. Both illustrations give a good idea of the nature of the rock encountered on the work, which in most cases is a gray close-grained granite and very hard to work. In a few spots sand and disintegrated granite have been met. Practically no trouble has been experienced from water seepage.

The air drills used were manufactured by the Chicago Pneumatic Tool Co., by the Rix Compressed Air Machinery Co., and the Compressed Air Machinery Co. Two drills are worked at each face. About sixteen holes are usually drilled for each blast, consisting of four uppers, four back holes, four cut-ins, and four lifters. A blast requires about 50 lb. of dynamite, Hercules No. 1 and 2, 40 and 60 per cent. powder being used. As a rule the blasts are set off at night or at evening between shifts. The broken rock from the blast is loaded into 2-ton steel ore cars and hauled by mules on the track to a dump at the mouth of the tunnel. Usually the dumps are below the grade of the main trail, so as to cause no interference with the pack trains or persons on the trail. Flat cars are used to handle the large and heavy rocks, and also for the removal of the drills during blasts.

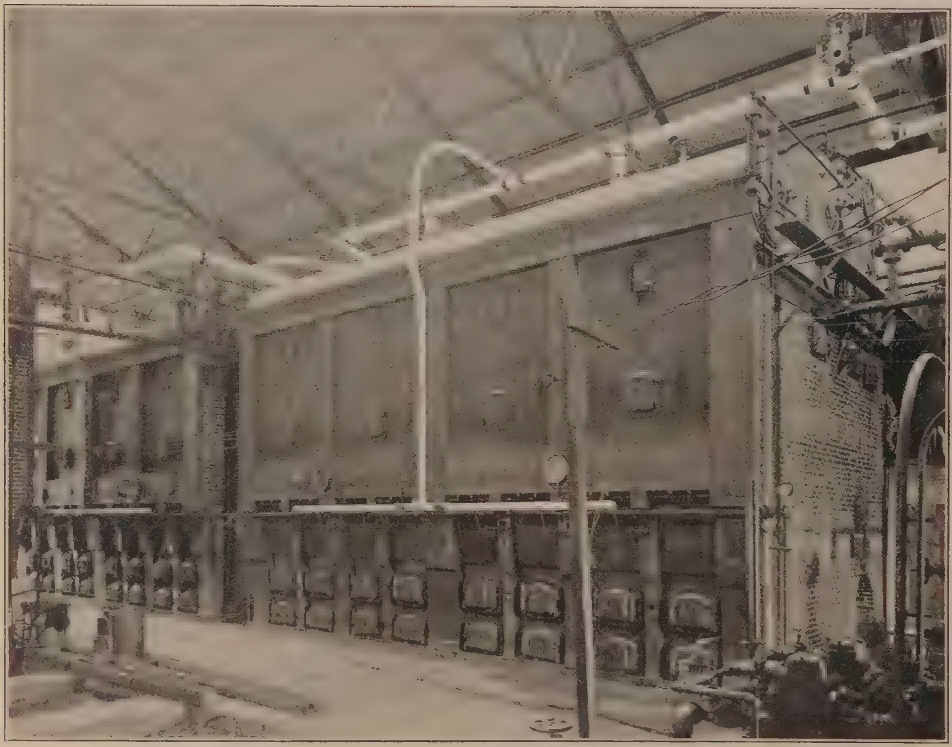
After the tunnels are excavated about 400 ft. from the mouth, it becomes necessary to install ventilating systems. A blower of the Root reversible type is installed near the opening of the tunnel or adit, and this is connected with the working face of the tunnel by means of 7-in. or 8-in. galvanized-iron stove pipe, suspended from a cable or single wire. The joints are rendered airtight by covering them with cheese-cloth and a coating of asphaltum. From 50 to 100 ft. are added to each pipe every month, the pipe being installed in 30-ft. lengths. The ventilating systems are reversible, fresh air being forced into the tunnel when the men are working, and the direction of the air being reversed when a blast is shot off, so as to clear the tunnel of smoke and dust. The tunnels are all lighted by means of electricity, and wherever possible the wires and lamps have been hung permanently on iron brackets from the roof, so that they can be used in patrolling the tunnels in skips after the water is turned in.

The present rate of progress on all the tunnels is between 3,000 and 3,500 ft. a month, and the average advance at each face, where air drills are used, is about 7 ft. in 24 hr. The company is doing all its work with day labor in two shifts, working 9 hr. each. The only contract work on the job has been for the supply of provisions and the feeding of the men.

Los Angeles Station No. 3.—In the northern portion of Los Angeles, on a part of the old bed of the Los Angeles River, and adjacent to the Southern Pacific tracks, is located the new steam plant for the Edison Company, known as Los Angeles Station No. 3. It is to be equipped as a large substation for the reception, transformation and distribution in the immediate vicinity of water-generated power, and for tying together the various water-power systems of the company centering at this point, and is also to include a supplementary steam plant. The steam plant with its transformer capacity is designed for 80,000 kw.

Plant at the Mouth of the Kern River Canyon.

An accompanying plan shows the general arrangement of the steam part of the station, consisting of the boiler and steam-turbine rooms. The boiler room is 60 ft. wide and is extended to a length of 125 ft., with a temporary bulkhead of sheet iron at the south end. The clear height of the rooms to the roof trusses is 28 ft. Three batteries of boilers are installed, each battery consisting of two 500-h.-p. Stirling water-tube boilers, equipped with superheaters superheating to 125° above 150 lb. pressure. A view of the boiler room taken during the construction period is given herewith. There is room for another bank of boilers, the foundations for which are already in place. Water for the station is taken from a surface well 50 ft. deep, from which about 4 cu. ft. per second can be supplied. The plant is equipped with a concrete stack 10 ft. inside diameter and 150 ft. high above the grate bars.



Boiler Plant of Los Angeles Station No. 3.

The turbine room is 39 ft. wide and 82 ft. in length to the temporary bulkhead at the south end. Of this length, 21 ft. at the north end is taken up by a hanging gallery for the switchboards and exciters. From the ground floor to the roof trusses there is a clear height of 45 ft., and 39 ft. above the ground floor are located the tracks of a traveling crane, which reaches all parts of the room. The turbine floor, or the main floor of the room, is 9 ft. above the ground.

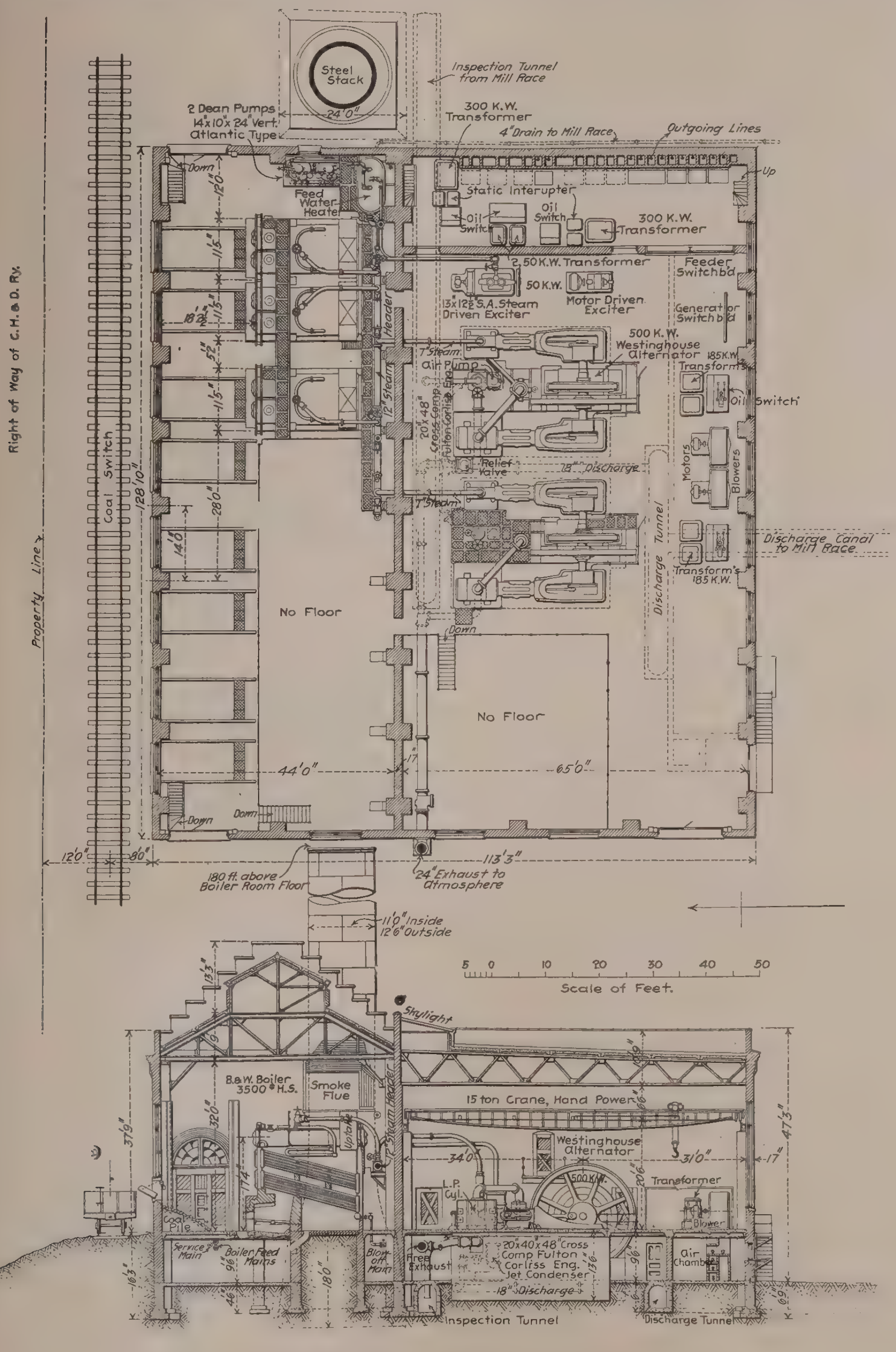
There is at present installed one steam turbine of the Curtis type, having a vertical shaft operating at a speed of 750 r.p.m. The unit has a rated capacity of 2,000 kw. and an overload guarantee of 3,000 kw. for 4 hr. The concrete foundation for the turbine is 12 ft. square at the floor level and 15 ft. square at the ground level. It is 10½ ft. high and the turbine stands 17½ ft. high above that. This unit was placed in use last April and has been in constant service on the daily peak of the load ever since.

The condensing apparatus for the turbine unit consists of a surface condenser of the marine type made by the Wheeler Condenser & Engineering Co., and a centrifugal circulating pump, motor driven. The air pump is of the Edwards triplex type and is driven by a 30-h.-p. induction motor. The condensers discharge through a vertical tube into the cooling tower passage, 5 ft. 9 in. wide, which is located in the gutter space between the two parts of the building. The cooling tower is situated at the west side of the building and has a large cooling area.

Under the switchboard gallery at the end of the room are located the brick-cell oil switches for the machine. On the gallery floor proper are two engine-driven exciters and the switchboard apparatus, the latter being of the remote-control motor-driven type. The controlling switchboard is at the edge of the gallery and is arranged so that the operator can overlook the turbine room.

The officers of the Edison Electric Co. include the following: President and treasurer, John B. Miller; vice-presidents, Henry Fisher, J. S. Torrance and H. H. Sinclair; secretary, W. R. Staats; assistant secretary, R. H. Ballard; assistant treasurer, W. L. Percy; manager, A. L. Selig; purchasing agent, H. S. Benedict; superintendent of power development,

F. E. Miller; chief hydraulic engineer, F. E. Finkle; mechanical and electrical engineer, O. H. Ensign; superintendent of distribution, C. A. Copeland; chief operator, B. F. Pearson. Practically all the hydraulic work, especially on the newer plants, has been designed by and installed under the supervision of Mr. Finkle, although the earlier work on the Santa Ana Plant No. 1 was executed under the direction of Mr. Ensign, who was assisted on the hydraulic features by M. L. Lumm and E. M. Boggs.



Plan and Cross-Sectional Elevation of Power House.

The power development work is now being carried on under the general supervision of F. E. Miller.

Forced Air Blast for Cooling has been adopted by the Reading Iron Co., which has recently installed in the tube works department two large electrically-driven Sturtevant fans for supplying air around the furnaces, to add to the workmen's comfort and to increase their output.

Power House of the Indianapolis & Cincinnati Traction Co.

The opening of the line of the Indianapolis & Cincinnati Traction Co., between Rushville and Morristown, is interesting not only as the first commercial use of the Westinghouse single-phase system, but also as marking the operation of an unusually well-planned power house. The selection of Messrs. Sargent & Lundy, of Chicago, as the consulting engineers of the company, made it certain that the equipment would represent the best practice for the purpose, and the short article on the road in this journal on Feb. 18 passed over so many features of the power station that it is proposed to devote this article wholly to it.

Current for the operation of 120 miles of railway is supplied from this station, which is located in Rushville, Ind., about 40 miles from Indianapolis, and about 80 miles from the other end of the completed line. The site is adjacent to the Cleveland, Hamilton & Dayton Ry., with a connecting track from that road to the company's side track alongside the power station, which track in turn is connected to the main track of the operating company. This arrangement is convenient for ordinary business, and will be especially useful whenever it becomes necessary to burn coal under the boilers. Natural gas is now being used. It will be possible for the operating company to deliver coal from its own line or take it from the C., H. & D. Ry., cars being shifted by electric power. The side track along the power station is built at a proper level for the dumping and crushing of coal, so that it can be handled by carrier and elevator, and fed under the boilers on chain grates without manual handling of any kind. A mill race from a neighboring stream runs along the east side of the power station, and the company has a perpetual contract for the use of this water for condensing and other purposes.

The station building is 113 ft. by 128 ft. 10 in., and is of very heavy construction. The foundations are of concrete and the upper walls of brick laid in cement mortar. The framework is steel. Floors are of concrete, and a gravel asphalt roof is laid on a concrete base with expanded metal. Provision is made for the installation of coal-crushing and automatic coal-handling machinery, with overhead bunkers feeding direct to the boiler grates. As natural gas is being used as fuel at the present time, the coal bunkers and carriers have not yet been put in, but everything is prepared for their installation, even to the punching of holes in the steel structure from which the coal bunkers will be suspended. Foundations for the engines, boilers, pumps and other machinery are concrete. Stairways are either steel or concrete. The John A. Schumacker Co., of Indianapolis, were the general contractors for the building, and the American Bridge Co. furnished the larger part of the steel work.

The power house is so constructed that the west wall can be taken out without disturbing the other walls or the present steel framework, and the building extended to the west. For this purpose a space of over 200 ft. has been reserved for extensions to accommodate the future needs of the company.

A concrete tunnel or pipe 3 ft. 6 in. in diameter, running under the basement floor, conveys the water from the mill-race to the condensers, and a similarly constructed tunnel is provided to carry the water back again to the mill-race, connecting at a point some 300 ft. below the intake. The supply tunnel is provided with an intake crib equipped with an iron grill and removable screens.

At the east end of the station, on a heavy concrete base, is a self-supporting steel stack 180 ft. high, lined its entire length with firebrick. The inside measurement of the stack is 11 ft. It is of sufficient size to take care of eight 350-h.-p. boilers, space for which is provided in the present building. The stack was constructed by the S. Freeman & Sons Manufacturing Co., of Racine, Wis.

The present equipment includes three Babcock & Wilcox water-tube boilers of 350 h.-p. nominal capacity each. Each boiler contains in the setting a Babcock & Wilcox superheater proportioned for about 100° superheat. Space is provided in the building for five additional boilers of the same capacity, which will be installed as rapidly as additional power is required. Natural gas is being burned under the boilers, but, as has already been said, provision is made for the use of coal if at any time the supply of natural gas becomes exhausted. The boilers are now equipped with flat grates set in an extension furnace, but the setting is arranged so that chain grate stokers can be easily installed when the coal-handling apparatus is put in.

The boiler room is equipped with a large open exhaust feed water heater of the Stilwell-Bierce make, and with two vertical Atlantic type feed pumps, built by the Dean Bros. Steam Pump Works of Indianapolis.

The engine room is provided with a traveling crane, built by the Northern Engineering Works, of Milwaukee, of sufficient capacity to handle all the machinery; this has greatly simplified the work of installation. The present generating equipment includes two 700-h.-p. Corliss type, cross-compound, condensing engines, built by the Fulton Iron Works of St. Louis, Mo. Each engine is equipped with an independent steam-driven jet condenser made by the Dean Bros. Steam Pump Works. The condensers are set in the basement, but are arranged for operation from the main floor level.

Each engine is direct-connected to a 500-kw., 2,300-volt, 3-phase, 3,000-alteration, Westinghouse revolving-field, alternating-current generator running at a speed of 94 r.p.m. The engines are operated at a steam pressure of 140 lb. per square inch, and are guaranteed to deliver the maximum capacity necessary to drive the generators.

The generators are of standard Westinghouse construction. The frames of the stationary armatures are of cast iron and surround inner cores of laminated steel, which are built up with overlapping joints so as to form a circular ring, slotted to receive the coils. The slots are of the partially closed type, and the coils are connected to give the three-phase relation. The field core is formed of laminated punchings dove-tailed to a cast-iron spider. It has thirty-two poles, each of which is wound on a machine-formed coil. The field is separately excited. The generators will develop full load continuously under normal conditions with a temperature rise not exceeding 35° Cent. above the surrounding air, and immediately following such a full load run will carry 50 per cent. overload for a limited period with a temperature rise not exceeding 55° Cent. The generators have a close inherent regulation, but arrangement has been made to further control the voltage by means of Tirril regulators mounted on the switchboard. The present engine room provides sufficient space for the installation of two additional generating units.

Two exciter sets have been installed, one of which is driven by a Westinghouse compound steam engine, the other by a type C induction motor, which, in turn, is driven from the main generators through transformers.

The generators are connected directly to two pairs of 250-kw. air-blast transformers which are connected according to the Scott 3-phase 2-phase system, to transform the current from 2,300 volts, 3-phase, to 33,000 volts, 2-phase, at which higher potential it is delivered to the transformer stations along the line of the railway, and to the lowering transformers in the power house, which supply the portions of the trolley located in and near the city of Rushville. Air to cool these step-up transformers is furnished by a pair of 90-in. fans made by the B. F. Sturtevant Co., and driven by Westinghouse type C induction motors.

The air-blast transformers are connected in pairs, and each pair is connectd in turn with its own generating unit. The high tension coils of the transformers are divided so that they may be connected for either 16,500 volts, while the low tension winding is designed for 2,300 volts, the potential of the generators. The insulation between the high tension coils and core was submitted to a test of 66,000 volts alternating current for one minute, and for the same length of time a potential of 4,600 volts was applied between the low tension coils and core. These transformers are designed to carry full load for 24 hours with a temperature rise of 25° Cent. above the temperature of the surrounding air, and after a full load run under these conditions each will carry an overload of 40 per cent. for two hours with a final temperature rise not exceeding 55° Cent. Their efficiencies are approximately 97.4 per cent. at full load, 97 at three-quarter load, 96.1 at half load, and 92.8 at quarter load.

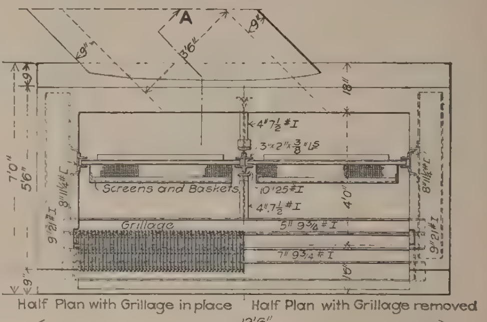
Between the high-tension coils of the step-up transformers and the main bus bars, 33,000-volt, oil-insulated, electrically-operated, 2-phase non-automatic switches have been installed. On each outgoing feeder leading to the transformer stations, a double-pole automatic switch of similar type has been inserted, and each outgoing feeder is also protected by disconnecting switches, which were made by the Westinghouse Company in accordance with designs specially prepared by Sargent & Lundy.

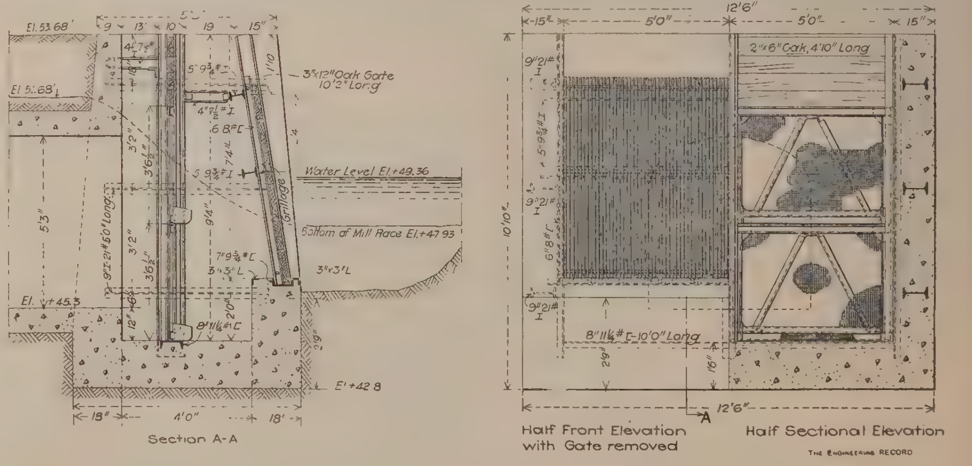
The generators are connected in parallel. The operating panels are located in the main engine room, forming two switchboards of blue Vermont marble. The first board is composed of five panels and provided with apparatus for the control of the two exciter sets, the motors which drive the ventilating fans for the step-up transformers, and the ammeters, voltmeters, wattmeters, Tirril regulators, synchroscopes and switch-control mechanism for the two 500-kw. main generators. As has been stated, all the switches are electrically operated, current for this purpose being supplied by the exciter set. As, however, the generators are governed by Tirril regulators, it has been thought wise to install a specially designed booster set in the switch-operating circuit, in order that the e.m.f. of the exciters may not be so reduced by the action of the Tirril regulators that the switch mechanism may fail to act; and in this way all possibility of failure has been overcome. The second switchboard is composed of twelve blue Vermont marble panels, designed to control the outgoing feeder circuits. Five of these panels are now blank, but will be equipped with the necessary apparatus when the operations of the road are more extended. The main bus bars occupy a portion of the basement. They are mounted upon heavy insulators which are supported upon a masonry structure which is very heavy and substantial. Provision has been made so that the air from the transformer fans is carried through the bus bar chamber. The bus bars are arranged in a double set, each of which is protected by a disconnecting switch.

The east end of the building constitutes what is called the high tension chamber, and is divided into four floors. The basement contains the bus bars, which are mounted similarly to those leading from the generators, together with the instrument transformers. On the main floor are installed the oil-insulated, electrically-operated, high-potential switches, which are controlled from the panels in the engine room, the lowering transformers from which the 550-volt alternating-current trolley line in the city of Rushville is operated, the lowering transformers—33,000 volts to 3,300 volts—which feed the sections of the trolley immediately next to Rushville on either side, the lowering transformers for the operation of the motors which drive one exciter and the ventilating fans in the engine room, and the static interrupters for the protection of the lowering transformers.

On the third floor have been installed the static interrupters which are connected to the main outgoing feeder lines, while the low-equivalent lightning arresters are mounted upon the fourth floor of the high-tension chamber. All switching is done on the high-tension side.

The general plan of operation is the transmission of alternating current over single-phase circuits at 33,000 volts to transformer stations which are located every 10 of 12 miles along the road, where the potential is reduced to 3,300 volts and connected direct to the trolley. The transformer stations require no attention as the feeder lines are all controlled from the main power house, and no moving apparatus is installed in the transformer houses. Because of the high potential at which the current is transmitted and fed to the trolley, no auxiliary feeders are necessary, and the total expenditure in copper is exceedingly low. The possibility of this saving constitutes one of the most important advantages of the alternating-current single-phase railway system.





Intake of the Indianapolis & Cincinnati Traction Company's Power Plant.

A Large Shavings Exhaust System, for which no less than 17 fans are employed to draw the shavings through distances as high as 700 ft., has been installed by the B. F. Sturtevant Co., of Boston, in the planing mill and cabinet shop of the Canadian Pacific Railway. The shavings are passed to the boiler house, where they are fed directly to the boiler furnaces.

Heating and Air Washing in a Works Office Building, Pittsburg

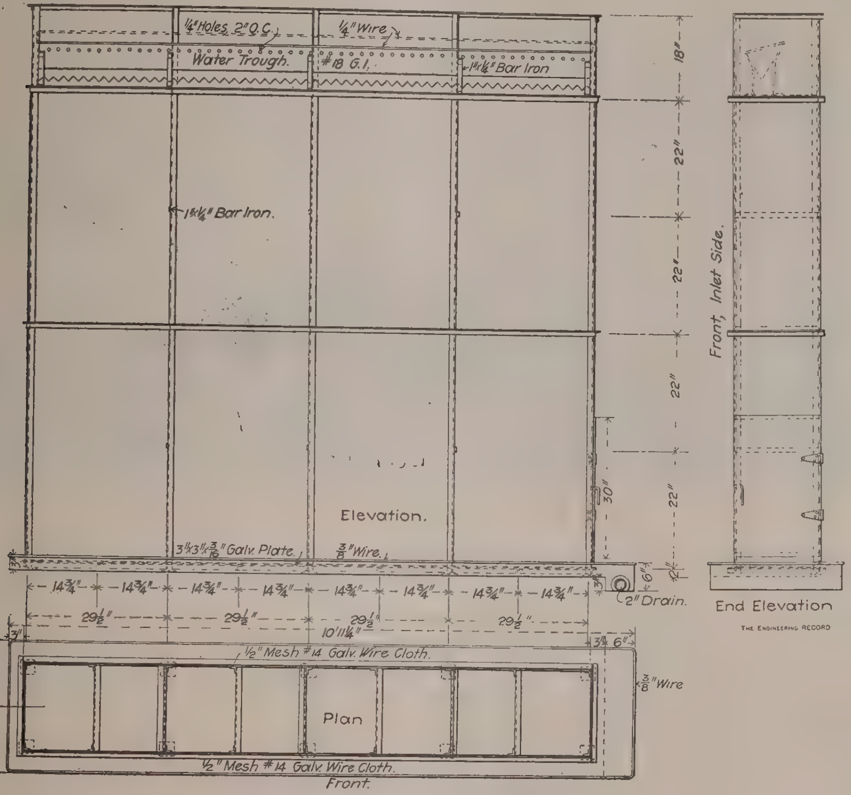
A fan system of heating that is of interest chiefly from the fact that it is in operation in he heart of the mill district of Pittsburg has recently been installed in the office building of he H. K. Porter Co., builders of light compressed air and steam locomotives for contractors and industrial plants and similar purposes. The heating plant replaced a direct radiation system that proved unsatisfactory because of the lack of provisions for temperature regulation and of means for preventing the inleakage with the outside air of the large proportion of soot particles characteristic of the particularly smoky atmosphere of the region in question. It is accordingly instructive that a system requiring a continuous delivery through the building of the outside air was determined on to meet the objections of the old system; the scheme adopted is to maintain a slight plenum within the building, so as to prevent infiltration through the building's exposed walls and windows and to pass all the air received from out of doors through a water-soaked coke filter for purifying it. The heating apparatus thus provides for ventilation as well as warming, and for the several months it has been in use it has been found a source of satisfaction in that papers and drawings are now kept clean.

The general arrangement of the office building and the distribution of the registers and flues of the heating system are shown in the accompanying plans of the first and second floors. On the former is also indicated the location of the heating apparatus and the run of ducts in the basement. The tempering coil, air washer, heating coils and fan are all grouped in one corner, where one of the basement windows is used as the air inlet, and the air ducts from the fan are circular in cross-section with branches to individual flues. These being a part of the new heating system, are not included within the building walls, but are necessarily run against them, although in positions where with expanded metal and plaster covering they simulate portions of the walls themselves. Exhaust flues were provided, and in the placing of the registers the so-called schoolhouse arrangement was followed in that the bottoms of the fresh-air register faces were fixed 8 ft. above the floor line, and the bottoms of the exhaust register faces 1 ft. above the floor line. The positions of the registers, including the openings from the fresh-air system to the basement and the vent from the toilet room in the basement, are shown, with the sizes of the corresponding flues.

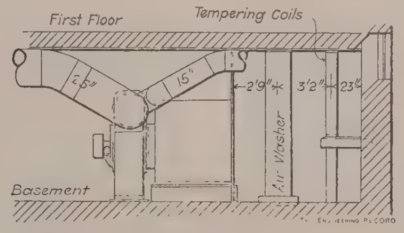
The system was laid out to effect a change of the air in the portions of the building warmed once every nine minutes, and heater capacity was installed to bring the air to about 120° Fahr. in zero weather, which, it was calculated, would offset the heat losses during zero weather, the rooms themselves to be maintained at 70°. The adopted degree of ventilation is equivalent to about 8,000 cu. ft. of air per minute, and a No. 70 Sturtevant blower was selected to do the work. This has a 3½-ft. blast wheel and a 3-h.-p. Bullock motor was furnished to drive it by belt. The interesting fact in this connection is that the unit is arranged for operation at constant speed, at 450 r.p.m., and that heat regulation is obtained by varying the number of sections of the main heater left under steam.

The amount of air required for each room being calculated, the areas of the register faces were determined on the basis of a velocity of 360 ft. per minute over the gross area of the register face. The corresponding flues are in general proportioned for a velocity approaching 600 ft. per minute, with the exception of the flue to the first floor against the vault structure and the one nearest the fan, which flues, owing to their relative short length, were made to offer additional resistance by increased velocities, being 785 and 700 ft. per minute in the two cases. The velocities in the basement ducts are graded from 1,400 ft. per minute in the branch ducts to the flues to 2,350 ft. per minute, which is the velocity at the fan outlet. It was assumed that 25 per cent. of the air delivered into the rooms would find its way into the atmosphere through open doors and the leakage openings such a building possesses, leaving 75 per cent. to be handled by the vent system. Here the velocities at the register faces were allowed to be 480 ft. per minute, on the basis of the gross register areas.

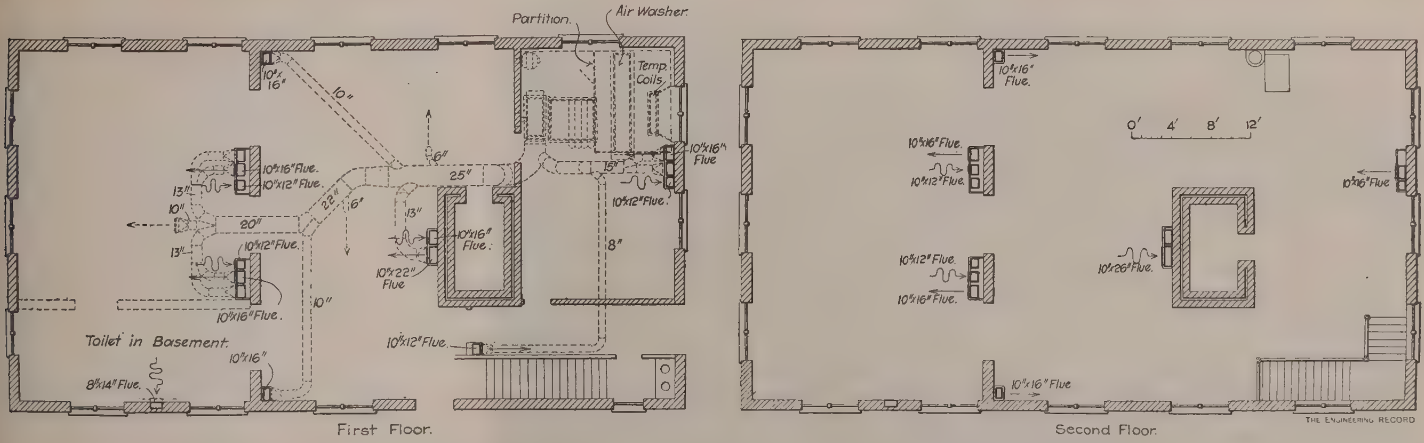
The tempering and heating coils receive reduced live steam ranging in pressure from 2 to



Construction of the Coke Filter.



Section through Fan Room.



Floor Plan of the Office of the H. K. Porter Co., Pittsburg, Showing Heating System.

5 lb., and a single four-row section for tempering purposes and four four-row sections for heating were deemed sufficient, the latter giving sixteen pipes depth. The coils are all provided with individual inlets and outlets valved independently.

The coke filter is constructed with a framework of 1¼x1¼x⅛-in. angles, with braces at the points shown of 1¼-in. bar iron. The ends are enclosed with No. 18 galvanized iron, while the front, back and bottom are covered with screens of ½-in. mesh No. 14 galvanized wire to hold the coke in position. The trough shown along the top is provided with a serrated bottom to distribute the water received through the holes in the side of the trough, in accordance with a usual method adopted in condensers in refrigerating work. The coke is broken small enough so that while the air cannot take a direct course through it, the mass is not so compacted that undue work is put upon the fan. No attempt is made to use the water over and over, while the supply of coke will need to be replenished, it is believed, but once in two to three years' time.

The heating plant was designed and installed by the Pittsburg office of the B. F. Sturtevant Co., under the supervision of the main office at Hyde Park, Mass.

Deep Artesian Wells in South Australia.

A 4,420-ft. Artesian well, sunk by the South Australian Government in developing the interior of the country, has an estimated daily flow of 600,000 gal., which reaches the surface at a temperature of 204° Fahr. The government has sunk twenty of these deep wells, which, it is stated in "Engineering," have an estimated aggregate daily flow of about 10,350,000 gal. The expenditure required to sink them, and for reservoirs and borings for artesian water is said to have reached over $3,200,000, and, although the revenue derived from them is small at present, the indirect advantage of having the wells are such that the project is considered to have already been attended with much success.

Tail Towers and Dumping Aprons of Traveling Cableways and Concrete Towers.

Traveling Cableways with Overhanging Tail Towers.

The New York Edison Co.'s power plant, at Thirty-ninth St. and East River, New York, will occupy a 200x350-ft. lot, which must be excavated to a depth of about 25 ft., and concreted for the massive foundations of the columns, walls and for the piers of the heavy machinery, which includes steam turbines operated by a 96,650-h.p. battery of Babcock & Wilcox boilers. The principal quantities include 50,000 yd. of earth and debris excavation, 18,000 yd. rock excavation and 20,000 yd. of concrete. To handle these materials two 522-ft. span Lidgerwood traveling cableways of novel design have been specially constructed and installed, and are now being operated.

The cableways are of the dimensions shown on the diagram, and are peculiar in that the tail towers have cantilever tops so that they can travel on a track laid on the dock at the bank of the river, and allow the buckets to pass through them and dump, outside their bases, on dump scows moored in the river, thus greatly facilitating the rapid and economical disposal of spoil. The reaction in one leg of the tail tower is about 97,000 lb. from the assumed working load stresses, and this tower is counterweighted with about 40 tons, and the head tower with about 10 tons of ballast besides the weight of the 9x10-in. hoisting engine with a 33-in. drum. The trolley has hoisting and traversing speeds of 150 and 700 ft. per min., respectively, and the greatest amount of spoil so far handled by both cableways in one day has been about 1,400 yd., although the capacity of the cableways is rated much higher.

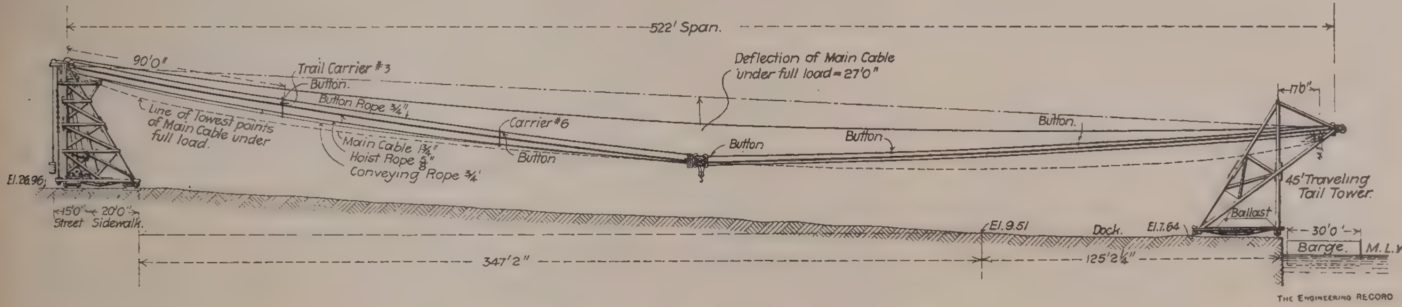
Traveling Cableways with Head Towers in Foreground.

The river end of the lot was enclosed by a cofferdam of 4-in. tongue and grove sheet piles, and all the water inside has been easily removed by a 6-in. centrifugal pump. The earth excavation was made by hand, and the spoil dumped over suspended guards and inclined aprons on the tail towers to scows which delivered it for filling on Riker's Island. The rock is cut by two channeling machines and ten drills, both manufactured by the Ingersoll-Sergeant Co., and operated by steam from the adjacent plant of the Edison Co.

The earth excavation has been completed, and the rock is now being excavated and handled in 5x7x2-ft. steel buckets made by the Union Iron Works, Hoboken, N. J. After the excavation is completed the cableways will be used to handle the concrete, which will be mixed at the tower shown in one of the pictures between the two tail towers of the cableway. This tower moves parallel with the cableways and carries elevated sand and stone bins, which will be filled by a stiff-leg derrick mounted on it and unloading the materials from the barges. Gates in the bottom of the bins will admit the materials to a measuring hopper, whence it will be discharged through a gravity mixer, and thence delivered by the cableways as required.

Work was commenced at the site Sept. 14, 1904, and has been carried on with an average force of about 100 men each in both day and night shifts, only two men being required to operate each cableway. The building was designed and its construction is being carried on under the direction of the engineering department of the New York Edison Co., Mr. Chas. B. Grady, M.E., resident engineer. Isaac A. Hopper & Sons, incorporated, Mr. Thos. T. Hopper, president and treasurer, are the contractors for the work here described. Mr. C.

L. Wachter, engineer for the Lidgerwood Mfg. Co., was in charge of the design and installation of the cableways, and Mr. W. Reeves is the superintendent for the contractor.



Excavating Cableway with Cantilever Tail Tower.

Utilization of Surplus Blast-Furnace Gas for Electric Power Development.

The introduction of the blast-furnace gas engine in this country has been viewed generally as offering such questionable advantages that a recent contribution by Mr. F. duP. Thomson, of Buffalo, and formerly of the Lackawanna Iron & Steel Co., analyzing the subject from the standpoint of conditions in the United States, is particularly welcome in the wake of the voluminous technical literature from abroad. While touching upon the utilization of the blast-furnace gas for heating and for compressing the blast, he has mainly discussed the commercial possibilities of developing electric power on a relatively large scale from the surplus energy in the gas over what is required for the preparation of the blast. It will not be possible to quote fully from this article, which appeared in the March issue of the "Electrochemical and Metallurgical Industry," but the following extracts from it will give a substantially complete argument of the limitations which he considers govern the adoption of blast-furnace-gas electric power generation.

To secure, within a reasonable degree of certainty, a continuity of supply, no group of less than three blast furnaces can be considered as available to supply a power plant, which is intended to produce power for the general market. At any group of furnaces at least one will at some time be out of blast for relining, and at least one other furnace may be stopped for some one other reason. With a group of three blast furnaces, therefore, the surplus gas of one will always be available.

The value of a large number of units to obtain a given output of iron is very evident, if the development of a large percentage of the surplus gas into power is to be made possible. Increased cost of construction and operation of a blast furnace plant made up of a number of small units as compared with the same items of expense for a plant of the same capacity made up of large units, must be more than balanced by the profits which are to be realized from the operation of the larger power plant. Further than this, the prices obtained for the power must warrant the continuance in blast of all but one furnace of a blast furnace plant, when trade conditions would imperatively dictate a suspension of operation. The profit must at least pay the interest on the labor and material invested in manufacturing periods in which there is no market for the product and at least part of the loss due to a falling market.

The blast furnace gas power plant is burdened with the responsibility of maintaining operations in spite of trouble which may occur at ore, stone and coal mines, coke ovens, along the lines of transportation, and finally at the blast furnace plant itself. Nor is this minimized to any great extent by the large stock carried in the furnace yards, for the troubles may occur at the end of the winter when the stocks are low.

Without wishing to discourage the idea of building commercial power plants in connection with blast furnace plants, he enumerated the foregoing to point out as clearly as possible all the disadvantages in the first instance.

The waste gases of the blast furnace contain about one-half of the total heat originally possessed by the fuel, and is approximately in direct proportion to the coke consumption per ton of iron. It has been variously estimated that from 18 per cent. to 33 per cent. of this heat is required to heat the blast. A conservative estimate of the percentage of the heat of the waste gases to heat the blast would be 30 per cent., and one which would not, in general practice, be exceeded. For the compression of the blast by steam engines, giving an economy of 20 lb. of steam per horse-power per hour when run condensing, under normal conditions, with boilers which convert 60 per cent. to 70 per cent. of the heat of the gas burnt into heat of steam, requires from 33 per cent. to 40 per cent. of the heat of the waste gases. For auxiliary purposes, such as pumps, light power for hoists and ore-handling machinery, approximately 7 per cent. to 10 per cent. is required. By the substitution of gas blowing engines and gas engines for the production of power for auxiliaries, the figures above may be reduced to read 16.5 per cent. to 20 per cent. and 3.5 per cent. to 5 per cent.

The wide difference between the surplus available under the head of steam engines, 42 to 17 per cent., is due principally to differences in efficiency of apparatus and only in a limited degree to differences in practice. The difference in surplus available under the head of gas engines, 52 to 42 per cent., depends almost entirely on differences in furnace practice, for the efficiency of the gas engine equipment is in each case the same. The maximum surplus with steam equipment is, curious to say, identical with the minimum to be expected with gas engine equipment.

The superiority of the gas engine over the steam engine may appear rather small. It must be remembered, however, that the gas blowing engine operates normally at only about two-thirds of the load which it must be designed to carry when the blast pressure reaches 25 lb. to the square inch. Such periods of high pressure may be coincident with a poor quality of gas, making the conditions even worse than indicated above. The gas engine in such service is at a disadvantage compared with a steam engine designed to operate with economy at normal load, with capacity, however, to supply air at the highest pressures met with in general practice.

Large gas engines are built to-day, which will, at full load, give a duty of 194,000,000 effective foot pounds, as compared with a duty of 82,000,000 effective foot pounds, from one of the best steam engines per 1,000,000 B.t.u. in the gas consumed in each case. As the economy of the gas blowing engine will approximate only 80 per cent. of the figure given above, it may readily be seen that its ultimate economy, in blowing engine practice, may be safely said not to exceed twice that of the steam engine.

The average of present practice in coke consumption is probably very close to 2,240 lb. per ton. We may reasonably expect a reduction of this figure to that of 1,700 lb., yielding 9,000,000 B.t.u., and improvements in engine and stove economy may permit the use of the larger percentage of surplus gas available with gas engines. The amount of surplus heat available for power per ton of iron may, therefore, be taken as 52 per cent. of 9,000,000 B.t.u. or 4,680,000.

From this amount of heat it is possible to develop 468 h.-p. per ton of iron made per hour, with gas engines, which have a thermal efficiency per effective horse-power of 25 per cent., or can produce one effective horse-power per 10,000 B.t.u. per hour. Manufacturers of gas engines are willing to guarantee this result when their engines are operated at full load. For a blast furnace making 300 tons of iron per day, we may rely with certainty upon obtaining not less than 300 × 468 ÷ 24 = 5,850 h.-p., or let us say, 6,000 h.-p.

It is now generally conceded that blast furnace gas must be cleaned before use in the gas engines; if for no other reason than that the cleaning process, at the same time, reduces its temperature and thus increases its density, thereby increasing the power available from a cylinder of given dimensions. At first the old coke scrubber of coal-gas works practice was used, consisting of a vertical pipe filled with coke through which water trickled from above, and gas was made to pass from below. In order to overcome the resistance to the passage of the gas through the coke, either a steam jet blower or centrifugal fan was used. It was found that the dust adhered to the blades of the fan, and to avoid frequent stoppages for cleaning, water was introduced at the center of the fan to wash the dust away. Not only did this water keep the fan clean, but being dashed into fine particles by the action of the arm and blades, became intimately mixed with the gas and dust, reducing their temperature. The action of centrifugal force, assisted also to separate the particles of water and moistened dust from the current of gas. The mixture of water and dust was very readily flushed out of the fan. We thus owe to accident the most effective form of gas washer that has yet been devised. The water consumption is approximately 0.06 gal. per horse-power minute, and the fan, motors and pumps take about 1.3 per cent. of the rated horse-power of the gas engine installation which they serve. Entire exemption from troubles incident to the presence of dust in the gas may be avoided, if the purity is so high that the gas contains no more than 0.025 gram per cubic meter.

In order to give the power proposition every benefit possible, we shall consider only the largest units at present obtainable, between 2,000 h.-p. and 3,000 h.-p. per unit. The cost of plant and cost of power must be based on certain assumed conditions of service and load factor. We will assume, for example, that the character of the service which the power plant is to supply will involve suddenly applied though possibly momentary overloads of 50 per cent., and that the load factor is 50 per cent. As the gas engine has no overload capacity, or stated differently, the nominal full rated load must be two-thirds of the actual full load capacity, for the case assumed. A gas engine of 2,000 effective horse-power, coupled to a 1,000-kw. generator, capable of momentary overloading to 50 per cent., would be a suitable combination. This class of service and type of unit will be designed as Class A.

For service in which there is never any overload, or where the full load of the generator is but 80 per cent. of the engine capacity and the generator overload never exceeds 25 per cent., a 2,000 effective horse-power gas engine coupled to a generator of 1,500 kw. would be a satisfactory unit, and we may designate this type and service as Class B.

In either class the space occupied would practically be the same and require for each unit a length of 50 ft. in a building 75 ft. wide, together with some additional length to house the compressors, pumps and exciters which go to complete the installation. No proposition, except one which utilizes all the surplus gas upon which we can depend, need be considered here. Nor shall we consider blast furnaces producing less than 300 tons per day each; but this must not be taken to preclude consideration, except in this particular case, of such a project for a group of smaller blast furnaces. The estimate here given is on a power plant in connection with a group of either three or four 300-ton furnaces, in which the surplus gas from one furnace only may be utilized.

The author's detailed estimates cover four 1,000-kw. units in Class A plant and four 1,500-kw. units in Class B plant. Allowing $5,000 for land, $67,500 for the building, and $280,000 for the engines, in each case, the total cost of the power plant, comprising also auxiliary apparatus and fixtures, was for Class A $580,000, and for Class B $600,000, the generators costing $100,000 in Class A plant and $120,000 in Class B plant. This made the estimated cost per kilowatt of total station capacity $145 in Class A and $100 in Class B; the cost per kilowatt of station capacity operated figured out at $193.33 and $133.33, respectively. One unit is regarded as in reserve in each case.

The cost of power at the switchboard was given as follows, the plants being operated under the conditions of load and power factor already set forth, with operation 24 hours daily: For Class A station, the cost of superintendence and wages was given as $20,450 per annum, or 0.156 cent per kilowatt-hour; supplies, including water, 0.143 cent; repairs and maintenance, 0.0885 cent; taxes and insurance, 0.0665 cent; capital charges (5 per cent. on investment and 8 per cent. on sinking fund), 0.578 cent., making the total kilowatt-hour cost, 1.032 cents. For Class B station, the cost of superintendence was placed at 0.065 cent; supplies, 0.0597 cent; repairs, 0.0382; taxes, 0.0286; capital charges, 0.248 cent; total, 0.4395 cent. The cost per kilowatt-year of station capacity operated was $45.12 in the case of Class A and $30.75 in Class B; the cost per kilowatt-year of power generated was $90.24 for Class A, and $38.40 for Class B. Assuming a profit of 10 per cent. on the investment would require a price of $128.70 for Class A and $55.15 for Class B.

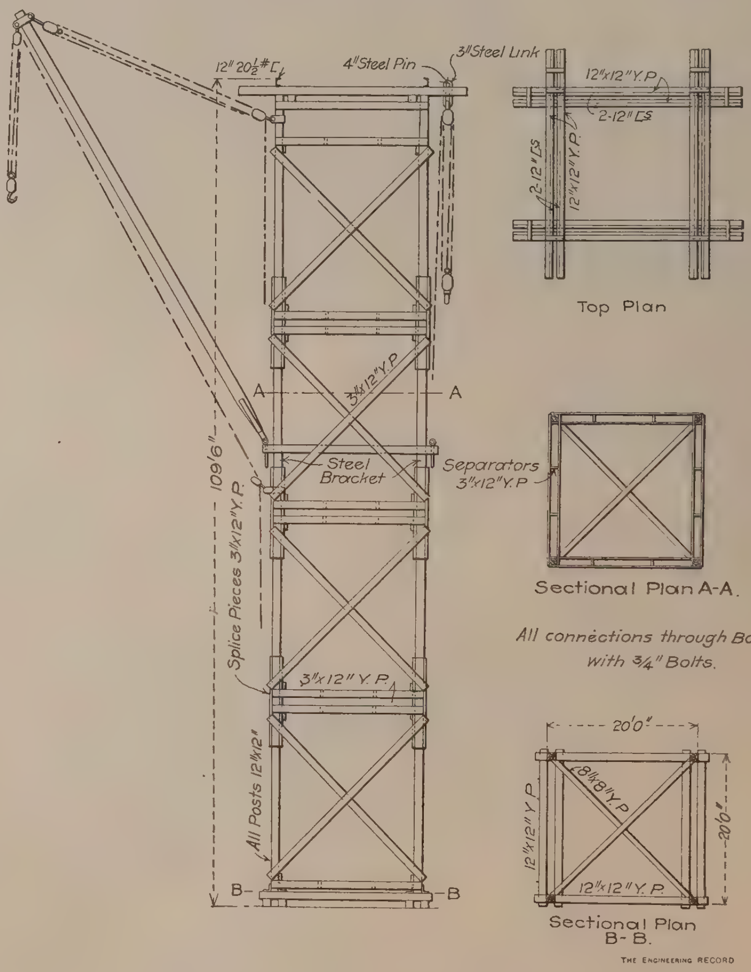
No allowance has been made for the value of the blast furnace gas. If the surplus were not thus utilized for the development of power it would be lost. The value of the surplus gas may also be taken as the sum of the capital charge of 5 per cent., and the profits, the sum amounting in Class A to $87,000, and in Class B to $90,000 per annum for a blast furnace plant, of which the yearly output is 300,000 tons of iron. An increase in profits to the iron manufacturer of approximately 30 cents per ton may thus be realized. If this is true of a plant which can convert but 25 per cent. of the surplus gas available, still better results may be expected from those at which the percentage of surplus convertible, owing to a greater number of blast furnaces, is greater. It would not be impossible to realize 75 cents or more per ton, where eight to ten furnaces are grouped.

Wherever there is a large demand for power and cheap water-power is not available and blast furnaces are, the blast furnace gas engine power plant need fear no rival. We are not far from the day when the power house will be as much a part of every modern blast furnace plant as are the condenser and ammonia houses of the modern by-product coke plant.

A Gasoline Motor Car has been constructed in the Omaha shops of the Union Pacific Ry. for experimental local passenger service at Portland, Ore. It is a rather small four-wheel affair, fitted with a six-cylinder Standard Motor Works' engine. The truck has been specially designed to be free from the rocking that marks the motion of trolley cars at high speeds.

The Erection of the New York Hippodrome Roof Trusses.

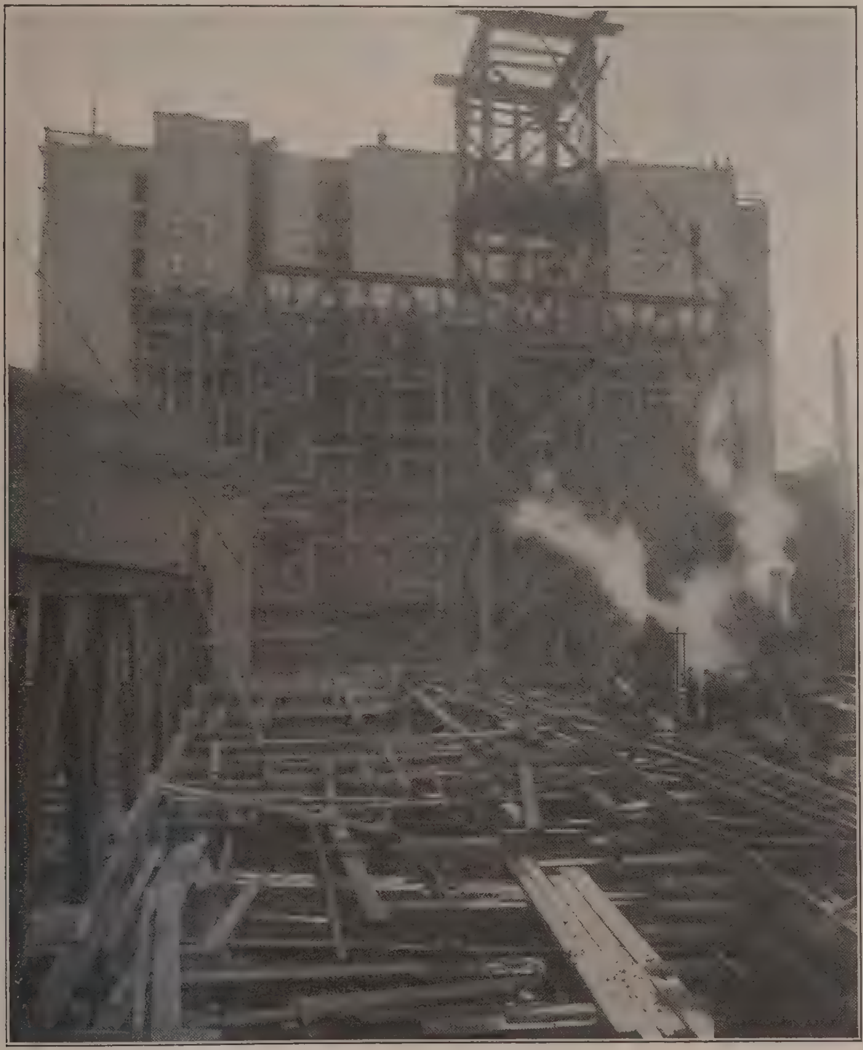
The Hippodrome is a steel frame building, about 200 ft. square and 100 ft. high, on Sixth Ave., between Forty-third and Forty-fourth Sts., New York. It has just been erected for circus and other arena exhibitions, aquatic sports, menageries and various amusement purposes, and has, in the main auditorium, a rectangular space about 108 ft. long and 108 ft. wide unobstructed by columns. Above it the roof is carried on four riveted trusses supported at a height of about 90 ft. in the clear above the curb, by a single column at each corner of the rectangle. These trusses vary in weight and dimensions; the largest is 108 ft. long, 14 ft. deep on centers, and weighs about 90,000 lb. Another, 95 ft. long and 15 ft. 3 in. deep over all, weighs 85,000 lb., and has heavier members. The I-shape top and bottom chords have short sections of the web at panel points, which project 2½ ft. beyond the top flange to form gusset plates receiving the field-riveted connections of the I-shape web members made with two pairs of heavy angles back to back. The other main trusses have T-shape chords and web members made of single pairs of angles.



Tower Derrick for Erecting Roof Trusses, Beams and Girders.

Each chord was received at the building in three pieces, with the connection plates shop-riveted between the flange angles. The pieces were bolted together and their splice rivets driven on the ground at the site by six Chicago Pneumatic Tool Co.'s hammers operated by two Franklin Air Compressors located in the street. The trusses were successively assembled in a horizontal plane on blocking at street level in the building. In the 95-ft. truss there were twenty panel-point connections, some of them having as many as 110 ⅞-in. rivets, and four chord splices, two of which had 152 field rivets in each. The field work was much facilitated by the fact that the trusses were completely assembled and all rivet holes reamed at the shops, so that little fitting was required at the site. Part of the trusses have vertical end posts and planed lower chord bearings riveted across the column caps, and others are web-connected to the columns with numerous field rivets through their lower end chord gusset plates.

The steel work up to street level and the columns supporting the main trusses were erected in the usual way with boom and breast derricks, and while the main trusses were being assembled and riveted on the first floorbeams a special timber tower was being erected adjacent to handle and hoist them. It had four 12x12-in. vertical posts 20 ft. apart and about 107 ft. high, each made in four nearly equal lengths, with square butt joints spliced with well-bolted scabs. The feet of the posts were connected by 12x12-in. angle flanges made of ¾-in. bent plates, to sills 27 ft. long. Overhanging double transverse and longitudinal caps in the planes of the tower sides rested partly on the tops of the posts and partly on the top horizontal struts bolted to them. These were made with 12x12-in. timbers about 32 ft. long and 4 in. apart in the clear, with their adjacent faces fitted to the webs of 12-in. channels, the upper flanges of which were closely fitted to the tops of the timbers and formed bearings for transverse bars of steel, 4 in. in diameter, which engaged and supported links passing between the timbers and affording connections for tackles.



Tower Erecting First Main Truss.

At the top and bottom of each story the tower was braced by a pair of 3x12-in. planks bolted on the opposite faces of each post and separated by spacing blocks between posts; X-brace planks were provided in the plane of each of these sets of struts, and in each panel of the tower faces. In the lower part of the third story four riveted steel plate and angle brackets were bolted to the posts on opposite sides of the tower and supported on each side a 12x12-in. horizontal timber 23 ft. long, with both ends cantilevering a little beyond the posts and bored for a vertical pivot pin by which a 65-ft. 10-ton boom was connected to the tower. Two of these booms were supplied and were set on opposite diagonal corners of the tower, although they could be set adjacent to each other or four could have been used if it had been desirable. They were fitted with 4-part manilla rope hoisting tackles and 4-part wire rope topping lifts.

The lower stories of the tower were erected by the derrick used for the steel work and the upper stories were erected by gin poles. The tower lifted the first truss with two 11-part tackles rove with ¾-in. plough-steel cables and suspended from the caps close to the tops of the vertical posts, and held it in position until it was service-bolted to the columns and the tower booms had erected some of the transverse members of the building and they had been connected to the truss, securely bracing it in position. The tower was then jacked up and wooden rollers placed between its sills and wooden track stringers laid on the steel floorbeams, and it was hauled by the hoisting engine to position for erecting the second truss, which was accomplished as the first had been. The other main trusses were successively erected in the same manner, the tower being moved eight times in all, one day being required for each movement, which was accomplished with about 12 men.

This tower and its booms erected nearly all of the 1,400 tons of steel in the upper part of the building, and was operated by two double-drum, foor-spool Lidgerwood hoisting engines permanently located in the street. A total average force of about 50 men was employed to operate the tower and assemble and rivet the steel work. The traveler was erected in the middle of November and taken down the first of January. Tackles were suspended from the roof trusses and attached to the upper story of the tower, and the scabs through its upper post splices were sawed through and the top section was lowered to the floor complete, and the connection bolts were unscrewed and driven out by pneumatic hammers, the pieces were matchmarked and stored for future use, and so on with the lower stories.

It is believed by the contractors that the work was erected much more quickly and economically by the use of this tower than it could have been on ordinary falsework for the great trusses. Such falsework was estimated to contain about 50,000 ft. b. m. of timber, against 20,000 ft. in the traveler, and would have obstructed the building and hindered the work and have been of no further use after the erection was completed, while the use of the tower left the floor space free for handling materials, and the tower was designed to be suitable for use in erecting almost any tall steel building, and is considered as a valuable permanent tool.

Messrs. Thompson & Dundy are the owners and architects of the building, Purdy & Henderson are the consulting engineers and designed the structural steel work, and the George A. Fuller Co. is the contractor, Mr. C. E. Hammond engineer in charge, and Mr. L. B. Baros, superintendent.

The Breaking of a Submerged Water Main.

The breaking of a submerged water main, which supplies water to a portion of the village of Potsdam, N. Y., was caused recently by the pressure of ice and the undermining of the main. The main is a 6-in. cast-iron pipe, laid on the bed of the Raquette River. A strong current along one shore had washed the soil from beneath the pipe near the point where it leaves the bed of the stream and left it unsupported for some distance. The weight of 20 to 30 in. of ice, which had formed on the river, was brought on the unsupported pipe during low water, forcing the pipe down and breaking it. Owing to the severity of the weather, considerable difficulty was experienced in making repairs. The ice over the pipe was first removed, then a trench was opened, the pipe raised and a collar leaded on over the break, after which the pipe was lowered and secured in place again.

Supporting the Electric Cables in the riser shafts of the lofty New York "Times" building, on Forty-second St., New York, is accomplished, in the case of those for the upper floors, by special pull boxes on both the seventh and fifteenth floors, thereby dividing into sections the weight they would each have to withstand if run in a continuous length through the shafts. In each box the cables are looper around porcelain insulators on an iron rod. Messrs. Clark & MacMullen, of New York, were the electrical engineers.

A Large Asbestos Theatre Curtain and Steel Work.

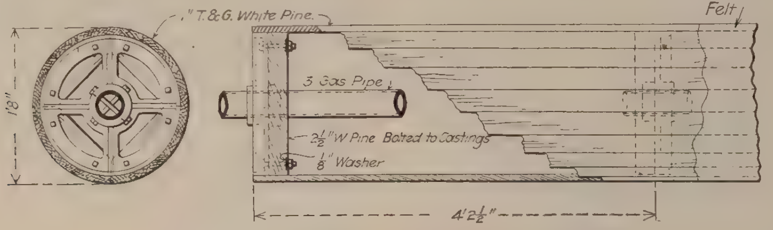
The roof garden stage of the New Amsterdam Theatre, New York, is protected by one of the largest fireproof asbestos curtains yet installed in any theatre. It is nearly 42 ft. high and 38 ft. wide, and weighs about 1,000 lb. It is operated by a counterweighted hand windlass which rolls and unrolls it on a wood and iron drum intermediately supported on adjustable counterweighted rollers. The ends of the curtain are contained in pockets made by the face of the proscenium arch wall, and by an 18-in. vertical plate and Z-bar attached to the wall and forming an offset shield. The curtain rises only 28 ft., and the remaining 14 ft. from its lower edge are provided, on the vertical sides, with snaps receiving grummets about 12 in. apart which engage a 3/16-in. vertical guide wire stretched very tight by sleeve nuts below the floor. The entire roller framework and apparatus are supported by the roof girders shown in the illustration of the steel construction of the theatre published in The Engineering Record of Nov. 19 and 26 and Dec. 3, 1904.

The roller is made with ten cast-iron transverse diaphragms like wheels, bolted through their hubs to a 3-in. gas pipe in the axis. Wooden quadrant scarf pieces are bolted to the faces of the diaphragms, and to their edges are screwed the horizontal tongue-and-groove lagging strips with which the roller is covered. The lagging is butt-jointed on the diaphragms, care being taken to stagger the splices of adjacent pieces. The lagging is covered with canvas tightly stretched and glued. The gas pipe is of the same length as the roller, and at each end there is fitted in it a solid steel gudgeon, secured by cross pins. To one gudgeon is keyed a wheel for the operating cable which leads down to a windlass drum at the fly-floor level, from which another cable leads up over a sheave at the height of the roller, and has suspended from its free end ten differential counterweights to keep the varying weight of the curtain always balanced.

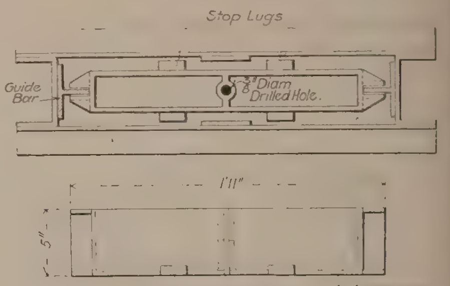
The counterweights are cast-iron boxes with grooved ends engaging vertical T-bar guides and having a center hole through which the cable passes freely. The lower box is special with a coned hole in the bottom, to which the end of the cable is made fast. The counterweights pass between horizontal angles connecting the guides and having pairs of lugs that project inwardly, riveted on in different positions so as to engage corresponding lugs on the boxes, and lift the latter successively from the cable as the curtain rises and the weight of the suspended portion diminishes. The adjustment of the counterweights was a delicate and tedious task and was effected experimentally by filling shot in the boxes and removing it until all were so accurately weighted that the curtain will descend uniformly if freed. This adjustment was prolonged on account of the varying resistances developed as the friction changed with the continued operation of the curtain. The normal tendency of the curtain, in any position, is to descend, and there is no means provided of preventing its descent except a friction brake on the windlass, which is continually kept in bearing by a suspended brake weight attached to its lever. When the curtain is raised or lowered it is necessary to release this brake by holding its lever up until the movement is made. In case of fire it is only necessary to cut the brake cord at any point, at the stage level or below, and the curtain immediately falls automatically in about nine seconds.

When the curtain was first hung the deflection of the roller caused it to cramp in the bearings so that it was difficult to operate it until a system of counterweighted intermediate bearings was provided to support it; and proved so successful that the curtain now works very easily and satisfactorily. A horizontal girder 23 ft. long, made of a pair of 10-in. channels back to back, with tie-plates across their flanges, extends just behind and below the curtain in a vertical plane through the axis of the roller. It is pivoted at each end to the projecting arm of a horizontal cantilever bar about 6 ft. long which is fulcrumed to the roof garden main roof truss, through which it passes at right angles just above the lower chord, and has a weight suspended from its long arm. Seated on top of this girder are six bearing rollers 11½ in. long, 13 in. in diameter in the middle, and slightly less at the ends. They are padded with several layers of thick felt and covered by canvas stretched tightly outside. These rollers being constantly and uniformly pressed upward against the curtain roller, maintain it without perceptible deflection and are concealed behind the curtain, which they entirely clear in all positions.

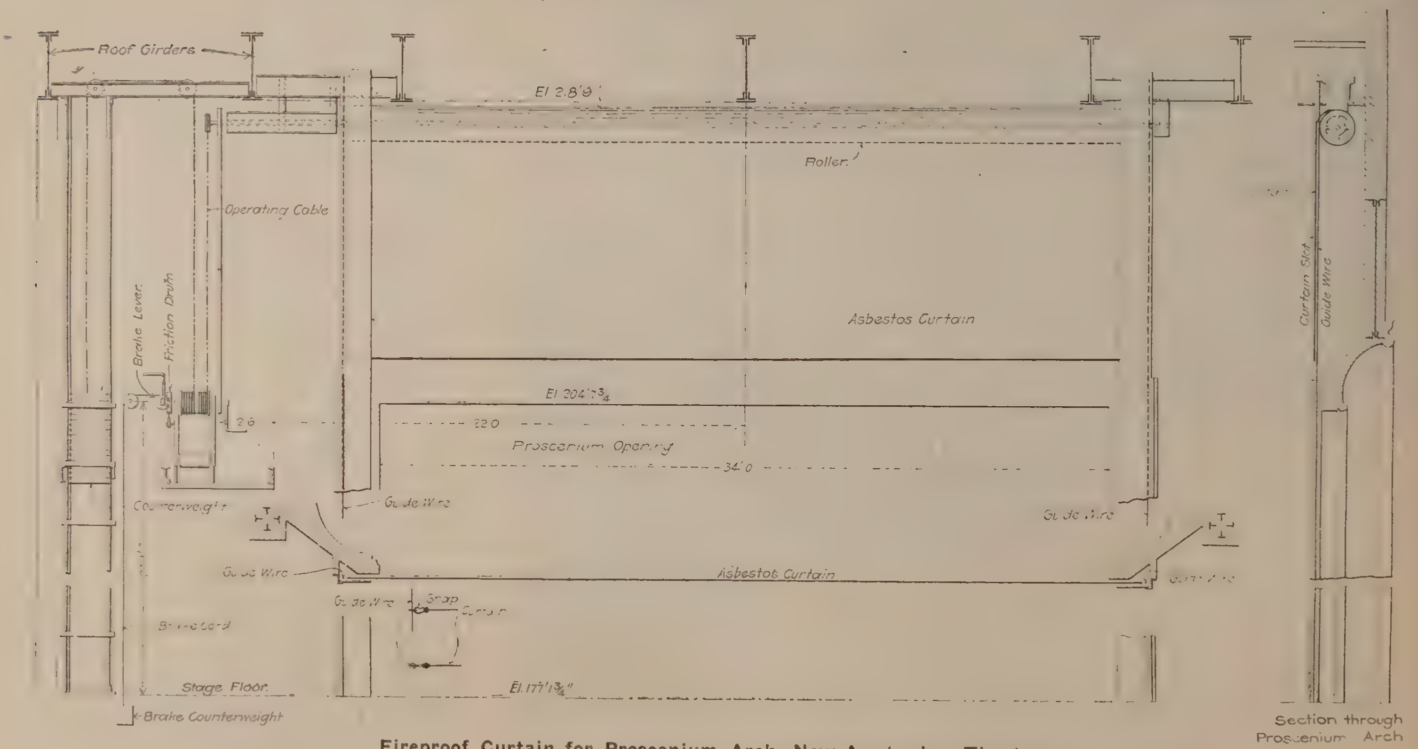
The curtain mechanism was designed by the J. H. Gray Co., structural engineers of the theatre; Mr. W. F. Gronau, designing engineer. The curtain was made by the H. W. Johns Co., and the steel and iron work was done by the American Bridge Co.



Wooden Roller, covered with Felt.



Counterweight Box



Fireproof Curtain for Proscenium Arch, New Amsterdam Theatre.

CURRENT NEWS SUPPLEMENT

MARCH 18, 1905.

Y OF NATIONAL ENGI-
ERING SOCIETIES.

SOCIETY OF CIVIL ENGINEERS.
ıas. Warren Hunt, 220 West 57th
ırk. Annual convention, Cleve-
)-23. Next meeting, April 5.

SOCIETY OF MECHANICAL ENGI-
etary, F. R. Hutton, 12 West 31st
ırk. Next meeting, New York.
ıaper by Prof. Barnes, of McGill
n experiments with ice below sur-
ıms.

INSTITUTE OF ELECTRICAL ENGI-
retary, Ralph W. Pope, 95 Liberty
ork. Next meeting, New York,
ıapers by Ernest Gonzenbach, on
of high-pressure to electric rail-
Geo. A. Damon, on high-pressure
ction for electric railways; and
rney, on the high-pressure trolley.

INSTITUTE OF MINING ENGI-
retary, R. W. Raymond, 99 John
rk.

INSTITUTE OF ARCHITECTS.
lenn Brown, Washington, D. C.

ION OF ENGINEERING SOCIETIES.
ohn C. Trautwine, Jr., 257 South
Philadelphia, Pa.

SOCIETY OF HEATING AND VENTI-
INEERS. Secretary, W. M. Mackay,
St., New York.

SOCIETY OF CIVIL ENGINEERS.
lement H. McLeod, 877 Dorchester
al.

FOR THE PROMOTION OF ENGINEER-
TION. Secretary, Prof. M. S.
University of Colorado, Boulder,

SOCIETY FOR TESTING MATE-
retary, Prof. Edgar Marburg, Uni-
ennsylvania, Philadelphia, Pa.

SOCIETY OF MUNICIPAL IM-
S. Secretary, George W. Tillson,
Iunicipal Building, Brooklyn, N. Y.

ION OF RAILWAY SUPERINTENDENTS
AND BUILDINGS. Secretary, S. F.
oncord, N. H.

RAILWAY ENGINEERING AND
CE OF WAY ASSOCIATION. Secre-
Fritch, 1562 Monadnock Block, Chi-
ıual meeting at Chicago, March 21,

WATER-WORKS ASSOCIATION. Sec-
M. Diven, Charleston, S. C.

FOUNDRYMEN'S ASSOCIATION.
Richard Moldenke, P. O. Box 432,

BUILDERS' ASSOCIATION OF THE
TATES. Secretary, J. L. Lyle, 39
St., New York.

DINNER, BOSTON SO-
TY CIVIL ENGINEERS.

annual dinner of the Boston Society
Engineers was held at the Hotel
Boston, on Feb. 28, and was attend-
members and guests. Pres. Fred-
ks presided, and opened the after-
aking by introducing John C. Traut-
Secretary of the Association of
g Societies. The latter stated that
ation now consists of eleven engi-
cieties which publish their papers
ıthly journal. He believed the Asso-
s only in its infancy and that its
is ought to include those of every
on of English-speaking engineers in
He thought the time would come
neering material would be published
ity. Mr. Trautwine then told of
ation as Secretary of the Associa-
the appointment of Frederic Brooks
cessor.

oducing the second speaker, Rev.
Dole, President of the Twentieth
lub, Mr. Brooks stated, that, as the
ciety of Civil Engineers is anxious
rters of its own, and, as the Twen-
tury Club has just achieved theirs,
might tell of their success in this
Mr. Dole spoke of the new quarters
ıh and wondered why, if the Boston
f Civil Engineers also needs new
quarters, it should not co-operate with his club. He drew many interesting comparisons between the work of the civil engineer and that of the minister, stating that both professions were composed of idealists and planners, and that we were all engineers working out an honest religion. The greatest engineer, he said, is one who has served humanity by leaving an enduring grand work which will be of service to his fellows.

The next speaker, Mr. Elliot Snow, U. S. Naval Constructor, said he was firmly of the belief that the present navy had reached its present point of efficiency through the co-operations of the electrical, mechanical, mining and civil engineers. The electrical engineer has made our modern battleship possible, the mechanical engineer has perfected the machinery, the mining engineer has furnished the best material for guns and the civil engineer has given dry docks and harbors.

Mr. John W. Ellis, a director of the American Society of Civil Engineers, responded for that society. He told briefly of the year's work of the society, of its phenomenal growth, and that the directors had under consideration the adoption of a plan which would increase the accommodations of the society by 50 per cent. He referred with pleasure to the successful visit of the members of the Institution of Civil Engineers to America as the guests of the American Society of Civil Engineers, and to the tribute paid by Sir William White to the engineers of this country.

Mr. Albert E. Leach, analyst of food and drugs of the State Board of Health, spoke on the adulteration of food, partly as follows: The people of the United States are well fed and the per capita cost for food exceeds that of any other nation in the world. The amount and abundance of the food is subject to control, but not the purity. The adulteration of food takes place principally in the small foods, but not in the staple ones, and, if indigestion is widespread, it is due mainly to the method of eating or, possibly, to the cooking. Of the foods on the market less than 5 per cent. of them are actually adulterated. Massachusetts was the first State to take any action toward protecting its citizens against adulterations. The laws of other States have been based on those of Massachusetts, but very few have laws which can be enforced. Mr. Leach then described the methods followed in collecting samples of food for examination and mentioned several cases of artificial adulteration.

The other speakers were Col. W. S. Stanton, Engineer Corps, U. S. A.; Lewis M. Hastings, City Engineer of Cambridge; Desmond FitzGerald, a Past President of the American Society of Civil Engineers; J. E. Harriman, Jr., George B. Francis and Henry Manley. Other guests of the Society were W. B. Leach, President of the New England Railroad Club; Judge James R. Dunbar, Charles W. Parks, Civil Engineer, Charleston Navy Yard: E. A. Church, R. S. Fosburgh and Henry Cummings, Jr.

THE PINTSCH SUCTION GAS PRODUCER.

ABSTRACT OF PAPER READ BY SCHUYLER F. SEAGER BEFORE THE MICHIGAN ENGINEERING SOCIETY AT LANSING.

In the fall of 1900 the firm of Julius Pintsch, of Berlin, Germany, put on the market a practical suction gas producer. Four years' practical experience with this plant brought many improvements and the construction of the present Pintsch suction gas plant is as follows: A blower, furnishing draft for starting the fire and raising the heat in the generator to the proper temperature for the production of gas; a generator, equipped with a grate on which the coal is burned, a hopper, which allows charging during operation, a window valve for inspection of the fire and fire doors for poking down; a vaporizer fitted with a small tubular boiler for the generation of steam and a relief pipe or chimney for use when the engine is not running; a scrubber consisting of a coke tower with a water spray for washing the gas; a cleaner containing wooden trays covered with wood shavings or saw dust through which the gas is filtered giving up the last of its dirt and dust; a governor or pressure equalizer for maintaining a steady pressure throughout the apparatus.

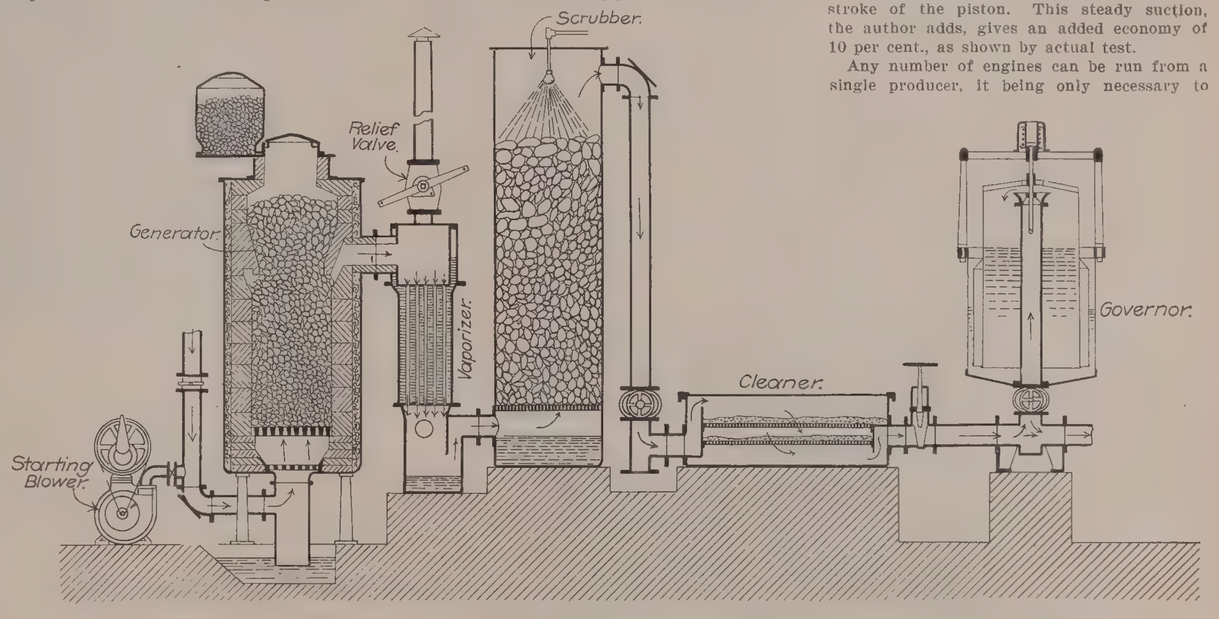


DIAGRAM OF THE PINTSCH SUCTION GAS PRODUCER SYSTEM.

To operate the plant, a fire is lighted in the generator and a small amount of coal added, the blower being run until the fire is burning strongly with the relief valve open. After 10 to 15 min. blowing, the fire is sufficiently hot to give off gas; the relief valve is then closed and the gas allowed to pass through the apparatus, the blower being kept running at slower speed until the gas burns freely at a test cock beside the engine. The engine is then started, the blower stopped and the formation of the gas becomes automatic, the suction stroke of the engine furnishing the draft through the fire.

In ordinary practice, the fire is left burning over night with limited draft, and only a few minutes blowing is required to brighten up the fire in the morning. The generator should be kept full of coal and the fire kept clean and bright. Since the apparatus is always under a slight vacuum, the fire doors can be opened at any time for cleaning out the fire.

The gas governor is a Pintsch patent. The upper being simply a chamber connected with the relief pipe or chimney, the middle, a small tubular boiler, and the base section acting as a cleaning pot and water seal when the engine is not running. By the passage of the hot gases through the flues of the boiler, the gas is cooled and steam which is passed back under the grate is generated. The cleaning pot or bottom section collects the heaviest dust and dirt coming over with the gas. By the admission of water to the cleaning pot on shutting down, the rest of the apparatus is water sealed and the gas therein kept intact for starting up again.

The scrubber should never feel more than warm to the hand, otherwise steam will pass through it to the apparatus beyond, carrying a considerably greater percentage of dust, and the gas will not be cool when it reaches the engine. In the cleaner the gas gives up the last of its dust and moisture.

The gas governor is a Pintsch patent. The engine on its charging stroke instead of drawing entirely from the producer draws its charge in part from the governor, and the governor spring then compensates this by drawing in a fresh charge from the producer. The resulting suction on the producer when the governor is used is a steady draught through the apparatus instead of the intermittent pull which is made by the suction stroke of the piston. This steady suction, the author adds, gives an added economy of 10 per cent., as shown by actual test.

Any number of engines can be run from a single producer, it being only necessary to attach a governor to the individual gas main leading to each engine.

The theory of the formation of the gas is that, by limiting the amount of air admitted to the fire, complete combusion of the coal is not permitted and the supply of oxygen being insufficient, carbon monoxide CO, is formed instead of carbon dioxide, CO_2, while the steam formed in the vaporizer is led back under the grate and breaks up on striking the incandescent fuel, giving free hydrogen and carbon monoxide, the carbon monoxide and the hydrogen forming the power gas for the engine. The average gas with a good grade of anthracite should have a heat value of 130 to 140 B.t.u. per cubic foot, and the constituents by volume should be as follows: Carbon dioxide, 6 per cent.; carbon monoxide, 24 per cent.; hydrogen, 15 per cent.; nitrogen, 55 per cent.

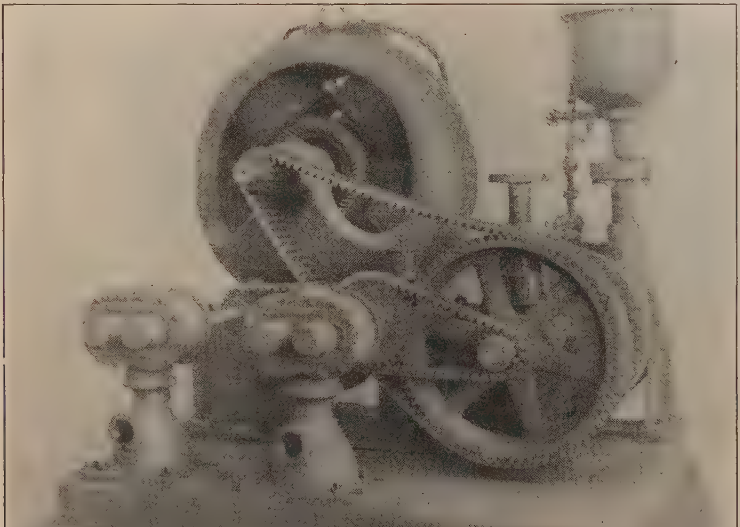
Injection of steam under the grate serves four purposes: It gives the hydrogen for the actual power gas; it furnishes oxygen to the fire on breaking up and gives greater freedom from clinkers due to more complete combustion; it keeps the grate cool and prevents the burning out of grate bars; it is made by the heat of the gas passing from the generator, utilizing this heat which would otherwise be wasted and bringing the gas to more nearly the temperature required at the engine, where it must be cool. Should the apparatus be of faulty design and more steam be admitted than the fire can break up, the effect will be a deadening of the fire and the diminution of the gas formed and in the end a complete shutting down. If an insufficient amount of steam is provided, the grates will burn out rapidly and the gas through a lack of hydrogen will be lacking in power. When anthracite is used the amount of water transformed should be from 0.8 to 1.2 the weight of the coal burned.

As an example of the efficiency with which the gas in this apparatus is cleaned and dried, an instance was cited of an installation of Julius Pintsch at Heusy, Belgium, where a plant was run for an entire year without any cleaning of either the engine or gas apparatus and the deposit of foreign matter found in the same at the end of the year was inappreciable. As for its reliability, a Pintsch producer and 50-h.p. Deutz engine was, in one instance, through necessity, run continuously night and day for nine months without a single stop for any cause whatsoever.

To date, the use of bituminous coal is confined to large units. To successfully operate a gas engine the tar must be removed, which necessitates either an elaborate system of scrubbers and cleaners, or the combustion of the tar in the producer itself. Working on the latter principle, Julius Pintsch now has in operation plants for both lignite and bituminous coal, and a plant of 400 b.h.p. is working admirably on bituminous coal with the very low consumption of 10 oz. per brake horse-power-hour. With bituminous coal at $3 a ton, this brings the cost down to less than 0.1 cent per brake horse-power-hour. Plants of the class described are manufactured by the American Suction Gas Producer Co., of Lansing, Mich.

A SMALL ELECTRIC REFRIGERATING UNIT.

An electrically driven refrigerating outfit that is noteworthy for the compactness of the unit and for the fact that its working parts are all mounted on a single base, was installed some time ago on the roof of the 22-story Hanover Bank Building, Nassau and Pine Sts., New York City. The accompanying half-tones show the general proportions of the machine, which is of 1-ton refrigerating capacity, set on a base 38x41 in. in size. The characteristic points are a rotary compressor,



CIRCULATING PUMP AND DRIVE OF REFRIGERATING MACHINE.

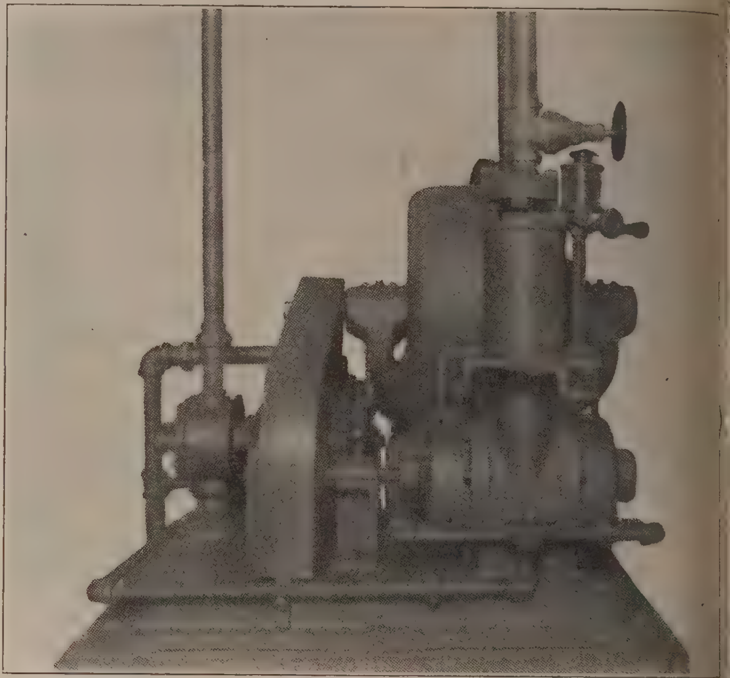
the compression system being employed, and the rotary pumps, one for the brine circulation and the other for the water circulation, both pumps as well as the compressor being driven from the motor, which is of 5-h.-p. capacity, by means of chain drives. The machine is typical of a line of relatively small capacity units manufactured by the Railway & Stationary Refrigerating Co., 136 Liberty St., New York, which employs ethyl chloride as the refrigerating medium.

Ethyl chloride, which is obtained by treating alcohol with muriatic acid, is used partly because of the relatively low pressures at which the gas can be liquified at ordinary temperatures of water and partly because of its neutral and permanent character, by virtue of which it does not attack ordinary substances, or tend to deteriorate. Its physical properties, as determined by Regnault, according to the "Physical Tables" prepared by Thomas Gray, and published by the Smithsonian Institution, indicate that it will boil at a temperature of zero Fahrenheit when the absolute pressure or vacuum is in the region of 4 lb., that it will boil at 54° Fahr. at atmospheric pressure, and that when the gas is compressed to 10 to 15 lb., which is ordinary practice at the plant mentioned, the temperature of the water would have to be at least 77° to prevent liquification of the gas, the practical result being that the working pressures may be kept low. The neutral character of the ethyl chloride is considered of advantage in that the piping can be constructed leak-proof, of copper or brass with soldered joints.

The compressor is of cylindrical construction, within which rolls a second cylinder set eccentric with respect to the larger cylinder. The special feature is a set of two pairs of blades, which fit into the cylindrical surface of the eccentric cylinder and sweep the space between the cylindrical surfaces, the design of the blades, it is stated, requiring the outer cylindrical surface to be slightly out of round, that is, not strictly cylindrical. The normal operating speed of the compressor is 200 r.p.m. The oil separator is fixed immediately above the compressor discharge, and the oil extracted from the ethyl-chloride gas is returned to the compressor for continuous use. The brine and water circulating pumps are driven, in the manner indicated in the illustrations, from the compressor shaft.

Both the condenser and the brine cooler are of a usual type. The compressed gas is passed through a helical coil in the condenser, surrounded by the circulating water, and is then expanded in the brine cooler through which the brine pump discharge is circulated in a similar helical coil. The expansion chamber for the gas in the cooler, from which chamber, of course, the suction of the compressor is led, is surrounded by a jacket to which the returning brine is brought before going to the brine pump.

In the installation mentioned, which serves a restaurant on the top floor, the circulating water is drawn from a roof tank provided for the sanitary fixtures of the building, for flushing purposes. The water circulating pump draws from it at the bottom and returns to it, through the condenser, at the top. The amount used in a given time is a small portion of the tank's contents, which, of course, is furnished with a more or less constant fresh supply from the pumping equipment of the mechanical plant of the building. In this way a special supply of water for the refrigerating plant was not necessary. Two refrigerator boxes are supplied, one of 1,144 cu. ft. of storage space, for butter, meat, eggs, etc., and the other of about 90 cu. ft., for fruits, salads and the like. In operation it has been found practicable to stop the machine entirely, late in the evening, and allow it to stand idle until morning. The speed at which the machine is run depends on the amount of work required.



ETHYL CHLORIDE REFRIGERATING MACHINE SHOWING COMPRESSOR.

NEW RAILROADS IN PERU.

By A. L. M. Gottschalk, U. S. Consul, Callao.

The present administration of Peru has infused new blood and renewed vigor into Peruvian affairs. The country has come to a general realization that the work before it lies chiefly in developing the vast and almost virgin territory lying east of the Andes, as well as in the establishment of connections by land between its cities. Roads and transit facilities, therefore, are what chiefly occupy the public attention, and the department of fomento (public works), under the guidance of Minister Balta, who is a civil engineer, has laid out a programme which bids fair to be realized within a few years, and to become in a sense epoch making for Peru.

It would be well for capital in the United States to study carefully this ground, which the opening of the Panama Canal will bring comparatively close to the United States, and to remember, in considering a railroad proposition for this country, that Peru offers guarantees of stability, both as regards a peaceful government and the obtaining of bona fide and valuable concessions in return for every mile of railroad built.

1. *Oroya to Huancayo.*—A commission of Government engineers recently finished the survey of a railroad between Oroya and Huancayo, which will have an approximate length of 13 miles. The work of construction was to begin under the Government in January. The route is through a well-populated valley, rich in agricultural products, coal and copper. The starting point (Oroya) is the terminus of the present Ferro Carril Trasandine, the road built years ago by Henry Meiggs, so that the new project will afford direct rail connection between Janja and Huancayo and Lima and its port, Callao. The importance of this road to Peru cannot be overestimated. Owing to the variety of altitude, this country is capable of producing, and does produce, the crops of the temperate as well as those of the torrid zone, so that an interchange of agricultural products between the mountainous interior and the coast is of great importance as regards the distribution of food supplies. Doubtless the new road will also make accessible to the coast a large mineral region, susceptible of much development.

2. *Sicuani to Cuzco.*—Cuzco, the ancient capital of the Incas, is at the center of an interior region which is both mining and agricultural, but it is accessible only by stagecoach road from Sicuani. Sicuani is connected at the Juliaca junction with the existing railroad between Puno, on Lake Titicaca, and the port of Mollendo. It is over this latter railroad that all the exports of Bolivia must travel for shipment to the outer world. The Sicuani-Cuzco road, actual construction of which was to be begun in January or February by the Government (it has already been thoroughly surveyed and studied), is to have an approximate length of 87 miles. It runs through good agricultural regions, will serve to transport passengers and for the Cuzco district, as well as agric and other exports from Cuzco to the coas

3. *Oroya to Ucayali.*—A railroad, approximate length of 248.5 miles is under Government survey, and constr is to be begun in 1906. This road is dently looked to as opening a new Peruvian enterprise and for foreign colo tion as well. Oroya, as pointed out alr is in direct communication by rail with and the coast, so that the Oroya-Ucaya will carve out the remainder of the pa from Lima and Callao, the chief expor point of the Republic, to the headwaters of Amazon River, through a country, mu which is virgin forest, and which sho rich in precious woods and rubber. The terminus is not yet fixed, but will be at s navigable point on the river Ucayali, w empties into the Amazon.

4. *Piura to Pongo de Manseriche.*—The cession for the building of this railroad just been granted to the Pacific Co. of York City, which, on November 23, made its deposit of $48,700 as a guarant good faith. The road is to be about 310 long, and will run from Piura, the cent the Peruvian cotton-growing industry, the shortest practicable distance to some gable point on the river Maranon, belo Pongo de Manseriche. The Maranon charges directly into the Amazon, so that road, like the Oroya-Ucayali line, will to connect the great transcontinental w way with the Pacific coast. In retur its work, the Pacific Co. enjoys by conce the right to construct and operate b roads as far north as the Ecuadorean fr and as far south as the parallel of 10° latitude, 3,280 ft. of land grant on eithe of the road and its branches, 7,413 acr virgin land on the eastern slope of the for every kilometer (0.62137 mile) of constructed, certain water rights, free of materials, rolling stock, etc., trading on the Amazon and its tributaries, and valuable considerations. The company gates itself to begin road constructio 1907 and to complete the work withi years' time.

The building of this road, like that Oroya-Ucayali line, is of immense impor not only commercially, but politically strategically, to Peru, whose immense valuable trans-Andean possessions ca developed and held free from encroach only by means of efficient transit fac between the more populous coast section Andean Peru) and the virgin country b the Cordillera. This montana country, is drained by numberless rivers—the waters of the Amazon—is full of possibi and would be more extensively colonized it not that its remoteness has, until now bidden its approach by any but the venturesome. Still there is a flourishing at Iquitos, which does an export and he Amazon and Brazilian ports) proportion to its size or remote e banks of the rivers are also nd there with smaller trading many persons have accumulated ing manufactured goods for rub- r native products of the semi- an tribes. The rubber, incident- e highest-priced sort known to d is generally known in the ets from its (Brazilian) export- "Para rubber."

Pisco.—This road, which is to iles, is intended to connect Lima of Pisco, the center of the grape ndustry of Peru, and will traverse f agricultural and stock-raising is thought that when the road the present high cost of living l be decreased by from 33 to 40 ost of Lima's produce, charcoal, oming from this region. It may lower the abnormally high freight ger rates charged by the two eamship companies which traffic on —a considerable hindrance to local at present. The Government has guaranty of 7 per cent. annual n the capital invested in this road ,435,000, and it is said that "The Corporation," a British syndicate ontrolling certain railroads in Peru, rtake its construction.

nbote to Recuay.—The railroad from (one of the best natural harbors st coast of South America) to Recuay 137 miles in length, and will reach vealthy mineral region, as well as coal fields of considerable magnitude. or of Chimbote is important. It is excellent authority, that and English has been formed to construct this d I am informed that these gentle- e already approached the Peruvian ent with a very favorable proposi-

ovar to Sechura.—Twenty-five kilo- 15.5 miles) of railroad are now under tion between the port of Bayovar in Peru and the sulphur beds at This is the work of private enter- erested in the sulphur deposits.

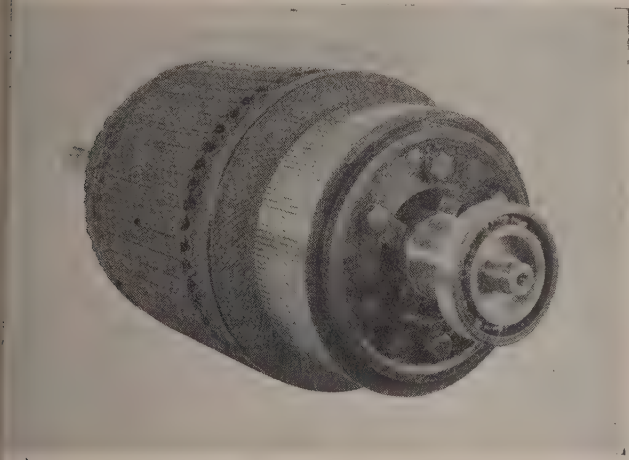
d to railroad capitalists of the United ooking for advantageous opportunities t be amiss, in recapitulation of what said.

resent Government of Peru has among f aims that of covering the country network of railways and of doing all possible to encourage foreign immi- and colonization. It is prepared to concessioners valuable .considerations vay of land grants, guaranteeing a cer- e percentage on the amounts invested, he opening of the Panama Canal will eru in comparatively close touch with ited States, and the facilities offered to concessioners will naturally be fewer an they are to-day. These points are noting.

Dodge Mfg. Co., Mishawaka, Ind., in its tion No. 61, describes its foundry and ery equipment for making fly wheels, e wheels, rope transmission wheels, and machinery castings, as well as the of hardwood lagging and hardwood or fly wheels that have been adopted plant.

THE INTER-POLE VARIABLE-SPEED MOTOR.

The Inter-pole variable-speed electric motor, which is manufactured by the Electro-Dynamic Co., of Bayonne, N. J., takes its name from the fact that alternating in position with the main field poles of the machine is a set of auxiliary poles, intermediate between adjacent main poles. The auxiliary poles are small compared with the main poles, and they are provided with coils connected in series with each other and with the armature. The object of the arrangement is to secure a magnetic field independent of the main field of the motor, in order to obtain a proper field for commutation throughout the speed range of the motor, for under ordinary conditions otherwise, the shifting of the resultant of the main field and that of the armature tends to prevent satisfactory commutation.


MOTOR ARMATURE SHOWING BALL-BEARING.

The coils of the auxiliary field, which takes, as explained, the current passed through the armature, are proportioned to secure the desired result, and a practical point is that the effect of the auxiliary poles is independent of the direction of rotation of the armature, because if the latter is reversed, the current in the auxiliary field is also reversed. As the armature current flows through the coils, weakening of the field of commutation by an increased load is prevented, and the auxiliary poles produce the compensatory field of commutation independently of the main fields, which with increased number of revolutions of the armature must be correspondingly weakened.

While the motor is essentially a variable-speed motor, it is intended also for constant-speed duty. It is designed especially to drive machine tools, pumps, blowers, wood-working machinery, laundry machinery and the like, either direct or in groups, and to operate on direct-current circuits of 110 to 500 volts without the use of multiple-wire circuits. It has, further, been constructed with the idea of reducing weight and the space to be occupied, and also for low speeds, so as to be more readily adaptable for direct driving of all classes and characters of machine tools and other classes of machinery. It is also worthy of note that the motor can be placed in any desired operating position, that is, as regards the shaft position, and it is made in the open, semi-enclosed and enclosed forms.

A particularly interesting feature, however, are the ball-bearings employed. These are of the Hess-Bright type, and consist of two races, one of which is fastened to the armature shaft and the other to the bearing housing, leaving the stress of rotation directly on the balls. Between the balls are placed spring separators which prevent the balls from rubbing against each other and serve also to hold oil-saturated felt or similar material to promote lubrication.

TRADE PUBLICATIONS.

The Abendroth & Root Mfg. Co., Newburgh, N. Y., has issued a new catalogue of the Root spiral riveted pipe. The different styles of this pipe, specials, fittings and connections for it, and two patterns of exhaust steam heads made in the company's works are described and illustrated in the publication.

A very complete discussion of the merits of the "Chicago Improved" type of cubical concrete mixer is given in a pamphlet issued by the Municipal Engineering & Contracting Co., Railway Exchange, Chicago. It also contains a long article on the choice of mixers, written by U. S. Asst. Eng. Clarence Coleman, of Duluth, and extracts from reports of the Chief of Engineers, U. S. A., regarding the work of the company's mixers.

Donegan & Swift, 6 Murray St., New York City, are distributing a 28-page circular illustrating both shaking and rocking grates for steam boilers and the Twentieth Century vortex steam blowers for forcing draft under the grates of boiler furnaces and inducing draft in chimneys. The grates shown are chiefly the Swift Imperial clinker-crushing type and the Swift Imperial rocking and dumping type.

The Goheen Mfg. Co., Canton, O., has published a folder describing the variety of structures for which Carbonizing Coating is applicable. Rules are given for its use and there are views of a number of important structures on which it has been employed.

The American Cement Co., of Philadelphia, has issued a handsome printed calendar in two shades of brown, red and gold, which suggests that Giant Portland Cement is "the" old reliable brand, of twenty years' standing on the market.

Chas. C. Moore & Co., San Francisco, have published a small wall map of the western part of North America, showing the territory reaching from the Arctic Ocean to the middle of Mexico which is covered by their machinery and engineering business.

A catalogue of the injectors, ejectors and lubricators made by The Ohio Injector Co., has been issued, which describes the details and operation of the many various types of these appliances which this firm produces.

Bulletin No. 1 on turbines and centrifugal pumps made by the department of hydraulic machinery of the I. P. Morris Co., Port Richmond Iron Works, Philadelphia, Pa., gives an historical sketch of the company since its founding in 1828, and an account of the most notable machinery installations that have been made by it. The largest turbines and centrifugal pumps which have been built in these works, including turbines for Niagara Falls and centrifugal pumps for the New Orleans drainage works, are shown in large cuts accompanied by brief descriptions.

By all odds the most artistic calendar sent to this journal lately came from the Kelly-Springfield Road Roller Co., Springfield, O. It is in the form of a panel poster 18 in. wide and 46 in. high, containing a pastel portrait of a woman all ready for a ride in something more speedy (although, of course, no better mechanically) than one of the company's heavy-weight cars.

Suggestions as to the method of constructing cement sidewalk paving have been compiled by Mr. Albert Moyer, manager of the sales department of the Vulcanite Portland Cement Co., Flatiron Bldg., New York. The pamplet contains a general description of the materials to be used, the manner in which they should be mixed, and the way the mixtures should be laid in place. Following this are three sets of specifications based on the method of laying that is employed by several of the leading companies engaged in the work.

Technical paints for gasholders, power plants and water towers are discussed in a 16-page pamphlet by Frank P. Cheesman, of the National Paint Works, Williamsport, Pa. The company does not make proprietary paints of which the ingredients are a trade secret, consequently its choice of materials is a very wide one, including carbon, blue lead, red lead, red oxide of iron, brown oxide of iron, graphite, kauri and asphaltum. The pamphlet gives the company's views regarding the materials best adapted for various purposes, and mentions important structures on which each has been employed.

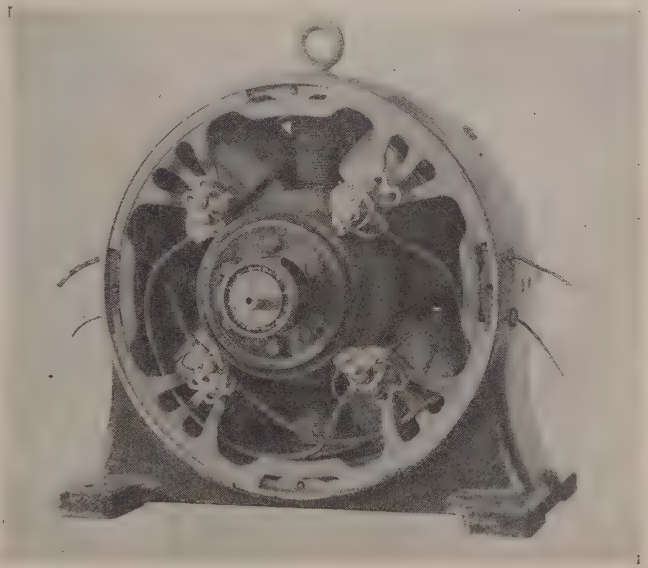
Warren Webster & Co., Camden, N. J., have prepared a brochure describing briefly, with sectional perspective views, the scheme of operation and the advantages of the Webster feed-water heater and chemical purifier.

A circular describing a device for quickly adjusting the length of a plumb bob string and for holding it in place after it has been adjusted, has been issued by F. Weber & Co., 1125 Chestnut St., Philadelphia, Pa. The same firm has also issued a circular descriptive of a ruling pen to which the principle of fountain feed has been applied, for waterproof ink.

BUSINESS NOTES.

Jones & Laughlin, Pittsburg, have ordered a 26x56x48-in. vertical cross-compound condensing engine for the electric station in their South Works. It will be built by the Allis-Chalmers Co., which has already furnished the works with two engines of this type.

Mr. Gardiner C. Sims has become associated with the Marine Engine & Machine Co., Harrison, N. J., which has secured all rights and patterns for building the Armington & Sims engine. It is understood that a number of improvements will be introduced in the engine when it is brought out by its new makers.


MOTOR WITH FRONT BEARING REMOVED.

The Builders' Iron Foundry, Providence, R. I., has furnished about 25 Venturi meters from 4 to 24-in. in diameter to the Solvay Process Co., for measuring water, brine, soda solution, hot water and other fluids. Three of the largest size were recently supplied for determining the performance of as many centrifugal pumps. One 8-in. and four 6-in. meters are now being made for the company.

Four 4,000-kw. 3-phase 60-cycle, 6,600-volt a. c. generators have been ordered from the Crocker-Wheeler Co., Ampere, N. J., by the Trustees of the Sanitary District of Chicago. They will be installed at Lockport in connection with Wellman-Seaver-Morgan horizontal water-wheels, and the power will probably be used for municipal lighting in Chicago.

The Charles Warner Co., Wilmington, Del., has recently closed contracts in Philadelphia for over 5,000,000 Diamond stone-brick, a sand-lime product. It is now made in a large variety of special colors, both plain and spotted, and with different classes of surface. The full annual capacity of the plant is 18,000,000, and it is expected that this year's output will be sold within a few weeks.

The main offices of the Locomotive Appliance Co. are now located in the Old Colony Bldg., Chicago.

The Allis-Chalmers Co., Milwaukee, Wis., will be represented hereafter in West Australia by F. R. Perrot, and in New Zealand by the firm of John Chambers & Son, Ltd. Mr. Perrot's headquarters are at Perth, West Australia, and those of John Chambers & Son, Ltd., are at Auckland. Chapin & Gore, Chicago, have purchased from Allis-Chalmers Co. three Reliance engines and three generators for direct connection to same, complete with switchboard, etc., to be installed as a plant for electric light and power used in the Majestic Theatre and office building in that city.

The Steel Company of Scotland, Ltd., Glasgow, has, according to London "Engineering," ordered from Mr. P. J. Mitchell, engineer, 52 Queen Victoria St., London, E. C., a complete installation of the Rateau exhaust steam accumulator or regenerator, together with a turbo-generator plant, condensers, cooling tower, etc. The plant is to utilize exhaust steam from one cogging-mill engine, one finishing-mill engine and four large steam hammers, and will eventually, when a second unit is installed, provide the works with 1,300 h.p. without increase in the present outlay for fuel.

The partnership that existed for about forty years under the name of the Union Akron Cement Co., for the sale of the Akron (Star-Brand) cement, was dissolved by mutual consent on March 1. The Akron (Star-Brand) cement will be sold hereafter by the Akron Cement Works, 1004 Morgan Bldg., Buffalo, and the Newman's Akron Cement Co., 141 Erie St., Buffalo.

The Turney Drier Co. has associated with the Henry Vogt Machine Co., Louisville, Ky., and moved its office and works to the Henry Vogt Machine Co.'s plant. The following officers have been elected: Adam Vogt, pres.; Henry Vogt, vice-pres., and Albert H. Vogt, secy. and treas. The company is now installing improved machinery to manufacture the direct heat and steam driers, roller and filter presses, and has secured a large amount of additional capital to carry on the business.

The Duff Mfg. Co., Pittsburg, Pa., has contract for a large quantity of Barrett track jacks for the Government Railway of Russia. This is the third contract from this source within the year received by the Duff Company, and the Barrett jacks have been adopted exclusively by the Russian Government for its railroad work. The Duff Company has also supplied the Barrett track jacks to the Japanese Railways, and it was a marked coincidence at the time that on the same day the first Russian contract was received, a large consignment of Barrett jacks was ordered forward by Japan.

The Reeves Engine Co. closed orders recently for the following engines: 16x16-in. horizontal for the Kansas City, Mo., City Hall; an 18x16-in. horizontal for the Sayville, L. I., Electric Co.; a 14x14-in. for the city lighting plant at Cedar Rapids, Iowa; a 6x7-in. vertical for the West Virginia Pulp & Paper Co., Tyrone, Pa.; two 12x12-in. horizontals for the Philadelphia works of George Hememant Co.; a 10x9-in. vertical for Swift & Co., Brooklyn, N. Y.; two 12 and 20x16-in. vertical cross compounds for Ben Stanley Revett, Denver, Colo.; two 10x9-in. verticals for Farr-Alpaca Co.; a 16 and 26x18-in. vertical cross compound for the City Hospital at Philadelphia, and numerous others.

PERSONAL NOTES.

Mr. L. B. Stillwell will sail for Europe shortly on a visit partly for recreation and partly for professional purposes.

Mr. Edward P. Martin has been elected president of the Institution of Mechanical Engineers of Great Britain. The membership is now about 4,500.

Mr. W. W. Vail, formerly chief engineer of the Gulf & Ship Island R. R., has become the engineer of Hodges & Mimms, railway contractors, Birmingham, Ala.

Mr. H. B. Stoner, recently appointed chief engineer of the Spokane Valley Land & Water Co., Spokane, Wash., was formerly assistant engineer of the Northern Pacific Ry.

Mr. Robert Forsyth, for 20 years chief engineer of the Union Iron Works of San Francisco, Cal., has been elected president of the company which operates those works.

Mr. William J. Chalmers has resigned as vice-president of the Allis-Chalmers Co., and has been succeeded by Mr. W. H. Whiteside, superintendent of the sales department of that company.

Mr. Elmer E. Barnard, assistant to the chief engineer of the new gravity water works at Lynchburg, Va., was married Feb. 27, at Washington, D. C., to Miss Belle C. Smith, of Knoxville, Tenn.

Mr. J. H. Hadley has been promoted from the position of roadmaster on the Missouri Pacific Ry. to that of division engineer on the St. Louis, Iron Mountain & Southern Ry., at Little Rock, Ark.

Mr. J. H. Hallberg, 45 Broadway, New York, formerly general superintendent of the Cincinnati Gas & Electric Co., is associated in a general advisory capacity with the Commission on Municipal Lighting of New York City.

Supt. W. V. Judson, Corps of Engineers, U. S. A., is one of the military attaches with the Russian army in Manchuria who are reported to have been with the detachments captured by the Japanese forces during the battle of Mukden.

An examination of candidates for positions as cement expert in the reclamation service of the United States Geological Survey, will be held in several cities in California and in Reno, Nev., March 29, by the United States Civil Service Commission.

Mr. James Simpson for many years master mechanic at McKeesport, Pa., for the National Tube Co., has been made superintendent of construction of the new mills now being erected there. He has been succeeded as master mechanic by Mr. Joseph Skewis, Jr.

Prof. Wm. H. Burr has been appointed consulting engineer of the Croton Aqueduct Commission of New York. He has practically served the commission in this capacity for two years or more, although he has only now been permanently retained by the Commission.

Mr. Robert B. Stanton, 66 Broadway, New York, engineer of the United Mining & Development Co., has been retained by an English syndicate to develop 800 acres of mineral lands on Rock Hill, Leadville, Colo. Five shafts about 800 ft. deep will be sunk on the property.

Mr. Samuel Rea, M. Am. Soc. C. E., has been elected president pro tem. of the Long Island R. R., during the illness of the president, Mr. W. F. Potter. As fourth vice-president of the Pennsylvania R. R. Co., he is thoroughly familiar with all the projects of the Long Island road and the unique difficulties attending its operation.

Mr. Chas. D. Knight has been appointed chief engineer of the American Electric & Controller Co., 12 Dey St., New York. He was formerly connected with the engineering departments of the General Electric Co., Schenectady, the National Electric Co., and the Cutler-Hammer Mfg. Co., of Milwaukee, Wis. Under his supervision the company will manufacture in addition to the "rheocrat," alternating and direct current controllers, starters, automatic switches, solenoids, etc.

The invention of the first commercial machine for making hollow concrete blocks was not the result of a chance inspiration, but was the outcome of Mr. Harmon S. Palmer's considerable experience as a contractor and builder. He made a specialty of sidewalks at one time, but as the price for this work decreased, he turned his attention to the use of similar fine grades of concrete in buildings. He became convinced that for ordinary building operations blocks were better and cheaper than monolithic walls, and he accordingly invented the machine for making them which bears his name.

Mr. W. W. King, general superintendent of the Norfolk & Southern Ry., died in Norfolk, Va., March 8. Mr. King was educated at Dartmouth College and entered railway service in 1875 as a chainman on the Geneva, Hornellsville & Pine Creek R. R. From 1877 to 1880 he was connected with the New York & Manhattan Elevated Ry. and resigned from the position of engineer and storekeeper on that road to accept the position of superintendent of construction and trainmaster of the Norfolk & Southern Ry. He was connected with the latter road in various engineering and executive positions from 1880 until the time of his death with the exception of two years, when he was engaged in construction work on other roads.

CONTRACTING NEWS

OF SPECIAL INTEREST TO

CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS

OF ENGINEERING AND BUILDING SUPPLIES.

CIVIL SUNDRY APPROPRIATIONS.

Public Document No. 216, as passed by Congress, provides for the following appropriations for the year ending June 30, 1906:

Appropriations and continuation of appropriations for public buildings under Treasury Dept.: (P. O.) Post Office; (C. H.) Custom House; (Ct. H.) Court House.

Alabama.—Anniston, P. O., $60,000; Selma, P. O., $30,000.

Alaska.—Sitka, repairs and preservation of C. H., Ct. H. and P. O. and quarantine station, buildings and wharf, $450,000.

Arkansas.—Harrison, P. O. and Ct. H., $32,500.

California.—Fresno, P. O. and Ct. H., $25,000; San Francisco, C. H., $100,000.

Colorado.—Colorado Springs, P. O. and Ct. H., $50,000.

Dist. of Columbia.—Bureau of Engraving and Printing Bldg., $65,000; heating, hoist, and and ventilating apparatus and repairs for all public buildings, including quarantine stations, under Treas. Dept., $250,000.

Florida.—Jacksonville, P. O. and C. H., $100,000.

Georgia.—Macon, Ct. H. and P. O., $50,000; Savannah, marine hospital, $80,000.

Illinois.—Chicago, P. O. and Ct. H., $250,000; Decatur, P. O., $25,000; Evanston, P. O., $30,000; Pekin, P. O., $27,500.

Indiana.—Anderson, P. O., $25,000; Crawfordsville, P. O., $27,500; Elkhart, P. O., $30,000; Hammond, P. O. and Ct. H., $25,000; Vincennes, P. O., $26,250.

Iowa.—Waterloo, P. O. and Ct. H., $62,500.

Kentucky.—Henderson, P. O., $25,000.

Massachusetts.—Amesbury, P. O., $33,750.

Missouri.—St. Joseph, P. O., $109,859.

Nebraska.—Hastings, P. O., $30,000; Lincoln, Ct. H. and P. O., $150,000.

New Jersey.—Atlantic City, P. O., $38,750.

New York.—Gloversville, P. O., $25,000; Kingston, P. O., $25,000; New York, C. H., $1,500,000; Niagara Falls, P. O., $40,000.

North Dakota.—Grand Forks, P. O. and Ct. H., $73,750.

Ohio.—Zanesville, P. O., $32,500.

Oklahoma.—Guthrie, P. O. and Ct. H., $50,000.

Pennsylvania.—New Castle, P. O., $30,000; Oil City, P. O., $30,000.

Rhode Island.—Providence, P. O., Ct. H. and C. H., $300,000.

South Carolina.—Florence, P. O. and Ct. H., $55,000.

South Dakota.—Pierre, P. O. and Ct. H., $60,000; Yankton, P. O., $30,000; Deadwood, P. O. and Ct. H., $50,000.

Tennessee.—Nashville, C. H. and P. O., $40,000.

Utah.—Ogden, P. O. and Ct. H., $40,000.

Virginia.—Charlottesville, P. O. and Ct. H., $35,000.

Washington.—Seattle, Ct. H., C. H. and P. O., $375,000; Tacoma, P. O., Ct. H. and C. H., $75,000.

West Virginia.—Huntington, P. O. and Ct. H., $30,000; Wheeling, P. O., C. H. and Ct. H., $30,000.

Wisconsin.—Superior, P. O., Ct. H. and C. H., $40,000.

Wyoming.—Evanston, P. O. and Ct. H., $75,000; Laramie, P. O., $50,000.

MISCELLANEOUS ITEMS.

Public Document No. 216—Appropriations and continuation of appropriations.

California.—Immigrant detention station on Angel Island, harbor of San Francisco, $100,000; at the Pacific Branch, D. V. S., Santa Monica, one barrack, $34,000, and storage reservoir, $7,100.

Cuba.—Guantanama, naval station and light-service, $25,000.

Delaware.—Establishing a light-house and fog signal on Goose Island Flats, Delaware Bay and River, $40,000.

Dist. of Columbia.—To the U. S. Geological Survey, $1,484,420, of which $350,000 will be used for topographical surveys in various portions of the U. S., $200,000 for geological surveys and $200,000 for gauging the streams and determining the water supply of the U. S. and investigating underground currents and artesian wells. To National Museum, $1,500,000. To National Zoological Park, for roads, walks, water supply, sewerage, improving grounds, erecting buildings, etc., $95,000; to Light House Dept., for repairs of light-houses, $740,000; to Dept. of Interior, for improvement of heating of old Post Office, $24,000; to continue construction of a building for a heating, lighting and power plant for House of Representatives, $363,000; to Government Hospital for Insane, for repairs and improvements, $30,000; roadways, grading and walks, $10,000; increased reservoir capacity, $6,750; extension of cold storage and ice-making plant, $7,500. To Freedmen's Hospital, for construction, $250,000. To War Dept., for construction and enlargement of buildings at military posts, $1,200,000; purchase of site for and toward the construction of an Army General Hospital, $100,000; to Light House Dept., for establishing, replacing and improving fog signals, including submarine signals and buildings, repairs, sites, etc., $210,000.

Georgia.—U. S. State Penitentiary lanta, $50,000; Augusta, Arsenal, tional machinery, $50,000.

Indiana.—To Marion Branch, D. V. Marion, for refrigerating and cold plant, $25,000.

Kansas.—To Western Branch, D. V. Leavenworth, for renewal of radiati face of heating plant in barracks an hall, $17,000. To Penitentiary at Ft. enworth for construction, $240,000.

Michigan.—Rock of Ages, Mich., lig fog signal station, $25,000.

Mississippi.—Vicksburg National Park, $75,000.

New Jersey.—Storehouses for war at Powder Depot, near Dover, $36,000 struction of sea wall at Sandy Hook,

New York.—Constructing a light Ambrose Channel, N. Y. H., $125,000 structing contagious disease hospital, ing additional power plant and appurt at Ellis Island immigrant station, 000; land for enlargement of Military Ft. Niagara, $150,000; enlargement ernors Island, $100,000.

Pennsylvania.—Extension of water system at Frankford Arsenal, Philad $22,000; Gettysburg National Park,

Virginia.—Southern Branch, D. V. Hampton, for a concrete and cemen wall, $18,000.

Wyoming.—Improvement of Yellow National Park, $83,000.

RIVER AND HARBOR WORK.

Public Document No. 215—Appropri for continuance and maintenance of under construction, and for further im ments, as passed by Congress for the year ending June 30, 1906:

Alabama.—Mobile Bay, $200,000; Bar, $50,000; Alabama River, $100 Black Warrior, Warrior and Tombigbee ers, $100,000.

Arkansas.—Ouchita and Black Rivers and La., $80,000; repair of revetment and bank protection, Red Fork Levee, sas River, $30,000; Lock and Dam No. 3 per White River, $160,000.

California.—Wilmington Harbor, $100 San Luis Obispo Harbor, $25,000; Oak Harbor, $250,000.

Connecticut.—Harbors at Norwalk, Mile River, Stamford, Southport and wich, $44,000; Thames River, $34,000; necticut River, below Hartford, $40,000 Haven Harbor, via Oyster Point and Kelly Ave. Bridge, in West River, $38,000.

Delaware.—Harbor at Wilmington, 000; Appoquinnimink, Murderkill and pillion Rivers, $20,000.

Dist. of Columbia.—Potomac River, 000; for emergencies to provide for res tion of channels, etc., $300,000.

Florida.—Harbor of Key West, $50 Hillsboro Bay, $348,350; Apalachicola $40,000; harbor at Pensacola, $100,000 Johns River, $100,000; also St. Johns at Orange Mills Flats, $25,000; Indian bet. Goat Creek and Jupiter Inlet, $20,0

Georgia.—Harbor at Savannah, $75 harbor at Brunswick, $40,000; Cumber Sound, Ga. and Fla., $30,000; inside route from Savannah to Fernandina, $40,000; Skidaway Narrows, $20,000; River, $20,000.

Hawaii.—Harbor at Honolulu, $200,0

Illinois.—Mississippi River, at M $286,000; Mississippi River, from Hea Passes to mouth of Ohio River, $1,000 Mississippi River, South Pass Channel, 000; harbor at Chicago, $200,000; Ill and Mississippi Canal, $300,000; Cal River, Ill. and Ind., $100,000.

Indiana.—Harbor at Michigan City, 000.

Kentucky.—Big Sandy River and Tug Levisa Forks, W. Va. and Ky., $43,000; of Ohio River, at Louisville, $80,000; and Dam No. 12, Kentucky River, $50,0

Louisiana.—Red River, in La., Ark., and Ind. Ter., $200,000; Calcasieu $100,000.

Maryland.—Patapsco River and chan Baltimore, $250,000.

Massachusetts.—Lynn Harbor, $40 harbor at Boston, $100,000; harbors at nis and Nantucket, $80,000; Woods Channel, $70,000; Little Harbor, Hole, $18,000; Merrimac River, $40,000; tic and Malden Rivers, $50,000; Wey Fore River, $57,000; harbor at Newbur $30,000; Sandy Bay, Cape Ann, $100,00

Michigan.—Harbor at Grand Marais, 000; harbor at Manistique, $25,000; at South Haven, $50,000; Saugatuck and Kalamazoo River, $75,000; harb Holland, Black Lake, $65,000; harb Grand Haven, $30,000; harbor at Mus $100,000; harbor at Frankfort, $20,000 bor at Charlevoix and entrance to Pine $25,000; harbor at Petoskey, $20,000; of refuge, Harbor Beach, $200,000; way across Keweenaw Point, from Kew Bay to Lake Superior, $45,000; Grand $100,000; Saginaw River, $30,000; St. River, at the falls, $420,000; Hay Lak Neebish Channels, St. Marys River, $50 Detroit River, $400,000.

Minnesota.—Improv. reservoirs at waters of Mississippi River, by rene Pine River Dam, $160,000; locks and Nos. 1 and 2, Mississippi River, bet. St and Minneapolis, $299,543.

Mississippi.—Horn Island Pass, $4 Pascagoula River, $150,000.

Missouri.—Osage River, $80,000; M River, at St. Joseph, $50,000; M River, bet. mouth and Sioux City, Hermann, and above Sioux City, total, 000.

**Items marked thus give the names of parties awarded contracts.*

shire.—Cocheco River, $21,711.

ey.—Passaic River, $40,000; iver, $20,000.

—Black Rock Harbor and Chan- ; harbor at Charlotte, $80,000; tle Sodus Bay, $30,000; harbor 100,000; harbor at Cape Vin- ; Bronx River and East Chester 0; East River and Hell Gate, arlem River, $75,000; Hudson 00.

ia.—Harbor at Erie, $125,000; ms at Herr Island, head of Six- and at Springdale, Allegheny 20; Delaware River, $500,000; River, Lock and Dam No. 3, io River in Pa., by completing ns Nos. 2, 3, 4 and 5, $500,000.

and.—Point Judith harbor of ,000; harbor of refuge at Block 00; harbor at Great Salt Pond, vidence River and Harbor, Nar- y and Green Jacket Shoal, $100,- ket River, $30,000.

rolina.—Harbor at Charleston, antee, Wateree and Congaree Estherville-Minim Creek Canal,

—Cumberland River, Tenn. and Nashville, $40,000; Tennessee Chattanooga, $50,000; Tennes- at Colbert and Bee Tree Shoals, ennessee River, below Riverton,

rolina.—Beaufort Inlet, $45,000; aland water route from Norfolk, emarle Sound, N. C., $22,000; Trent Rivers, $40,000; Cape Fear d below Wilmington, $150,000.

arbor at Sandusky, $125,000; har- on, $68,500; harbor at Lorain, rbor at Cleveland, $200,000; har- port, $135,000; harbor at Ashta- 00; Conneaut Harbor, $60,000; River, rebuilding lock and dam 10,000 general improv. of Ohio 000; Ohio River, in Ohio and W. 0.

-Coquille River, $55,000; Upper d Snake Rivers, $25,000; Colum- at the Cascades, $30,000; Willa- r, above Portland, and Yamhill 00; Lower Willamette and Colum- below Portland, $100,000; mouth River, Ore. and Wash., $400,000; iver, bet. foot of The Dalles Rap- d of Celilo Falls, Ore. and Wash.,

-Sabine Pass, Tex. and La., $150,- of Brazos River, $50,000; Aran- 100,000; Galveston Harbor, $200,- ston Channel, $175,000; Galveston l and Buffalo Bayou, $200,000; ston Bay Channel, Double Bayou s of adjacent streams, $50,000; er, from Velasco to Old Washing- 0; Brazos River, from Old Wash- Waco, $75,000; Trinity River, Sabine and Neches Rivers, $411,-

Norfolk Harbor and approaches, arbor at Cape Charles City, $25,- ahannock River, $40,000; James ,000.

ton.—Grays Harbor and Chehalis 000; New Whatcom Harbor, $35,- way connecting Puget Sound with ion and Washington, $125,000; vaterway in Tacoma Harbor, $40,- mbia River, bet. mouth of Willa- er and Vancouver, $30,000; Puget its tributary waters, $20,000.

irginia.—Little Kanawha River,

in.—Harbor at Racine, $30,000; Milwaukee, including harbor of 50,000; Sturgeon Bay and Lake Ship Canal, and harbor of refuge, harbor at Duluth, Minn., and Su- s., $270,000.

WATER.

rranged Alphabetically by States.

o under "Civil Sundry Appropria-

Ala.—A. M. Lockett & Co., of New a., have secured the contract for tary water pumping station of 180 and 3,500,000 gal. engine, Worth- ple type; cost, $10,000.

al.—The State Assembly has passed ropriating $40,000 for the purchase djoining Napa State Hospital and uction thereon of a dam and reser-

geles, Cal.—City reservoir bonds to at of $150,000 are reported to have It is proposed to construct a dam epherd's Canyon to form a reservoir d about 1,000,000,000 gal. of water. olland, Supt. Water Wks.

se, Colo.—Bids are wanted Apr. 1 shing material and constructing a pipe line, storage tank and distribu- em for Montrose, as advertised in neering Record.

ury, Conn.—The State Senate has favorably the bill authorizing this sue $75,000 water bonds.

ill be received Mar. 21 by the Bd. s., for laying 4,000 ft. 6-in. and 620 water main in Plaza Ave., Grand, and Railroad Hill Sts. R. A. ity Engr.

bot, Idaho.—The Village Trus. are o have granted Dolph Johnson a for water works.

lle, Ill.—The Town Council is re- have under consideration the con- of water works. The National o., of South Bend., Ind., is stated to bmitted a proposition to install a

Danville, Ill.—The Danville Water Co. is reported to be having plans prepared for a new settling basin, to cost $40,000.

**Streator, Ill.*—The Water Co. is stated to have awarded to the Holly Mfg. Co., of New York, N. Y., the contract for a 5,000,000 gal. high duty pumping engine.

Bradley, Ill.—Bids will be received Mar. 29 by Lewis Clark, Pres. Village Bd., for furnishing f. o. b. cars all machinery, material and supplies of every kind necessary for water works.

Elgin, Ill.—In regard to the proposed standpipe, we are informed that no steps have yet been taken toward its construction. If constructed it will cost $10,000. R. R. Parkin, Supt. Water Wks.

Oolitic, Ind.—See "Power Plants, Gas and Electricity."

Iowa Falls, Ia.—The Western Steel Constr. Co., of Des Moines, is stated to have submitted the lowest bid on Mar. 6, for constructing a pumping station, for about $7,000.

Tonganoxie, Kan.—Burns & McDonnell, Dwight Bldg., Kansas City, Mo., are prepared plans for water works. An election to vote on issuing $12,000 water bonds will be held on Apr. 3.

**Alexandria, La.*—Patorno & Co., of New Orleans, are stated to have secured the contract for sinking an artesian well, for $3,500.

Augusta, Me.—The Augusta Water Dist. will require two 3,000,000 gal, pumps for its new supply. Contracts will probably soon be let. W. B. Getchell, Resident Engr.

Russell, Mass.—E. D. Parks, Town Clk., writes that the proposed water works will cost from $8,000 to $10,000. Engineers, Durkee, White & White, Springfield.

Grand Rapids, Mich.—The Bd. of Pub. Wks. is stated to have voted to ask Council to submit a proposition at the spring election to issue bonds to the amount of $700,000, for the improvement of the water supply. Two questions are to be submitted, one for $110,000 for additional pumps; the other for $590,000 to be used for removal of the intake pipe to above the Soldiers' Home, estimated to cost $440,000, and the installation of a filtration plant to cost $150,000.

Minneapolis, Minn.—The Water Dept. is reported to be planning to expend $150,000 on water mains this year.

Springfield, Minn.—The question of constructing water works and a sewerage system is reported under consideration.

New Albany, Miss.—See "Power Plants, Gas and Electricity."

Liberty, Mo.—The citizens are reported to have voted Mar. 7 to issue $55,000 bonds, for the construction of water works.

Newcastle, Neb.—Bids will be received Mar. 22 by W. R. Talboy, Chmn. Village Bd. for constructing a gravity system of water works; cost not to exceed $6,500.

Howell, Neb.—Bids will be received by the Village Clk., on Mar 23 for the construction of water works. For further information address Engr. Thos. Shaw, Paxton Blk., Omaha.

Falls City, Neb.—It is reported that about $10,000 will be expended for improving the standpipe and pumping station.

**Butler, N. J.*—W. P. Partridge, of Scranton, Pa., is reported to have secured the contract for constructing water works for the Water Co., for about $27,000.

Newark, N. J.—Governor Stokes has signed the bill authorizing Newark to issue $1,950,000 storage reservoir bonds.

Bids will be received Mar. 24 by J. H. Bacheller, City Compt., Rm. 5 City Hall, for $1,950,000 storage reservoir bonds.

Carlsbad, N. M.—The Farmers' Irrigation & Land Co. is reported incorporated, with a capital of $25,000 and headquarters at Carlsbad, to build a 15-mile canal out of the Pecos River in Eddy County.

Bernalillo, N. M.—The Algodones Land & Irrigation Co. is reported incorporated, to build a 10 mile irrigation canal out of Rio Grande River at Algodones. Headquarters at Bernalillo; capital, $100,000.

Syracuse, N. Y.—This city contemplates laying a new conduit from Skaneateles Lake to Syracuse.

Oswego, N. Y.—Plans and specifications are about completed for the proposed water works improvements, to include new pumping station, force mains, etc., to cost $200,000. Chas. H. Snyder, City Engr.

Watertown, N. Y.—The Water Bd. is stated to have petitioned Council for an issue of $100,000 bonds for water works improvements. $51,000 of this is to be expended for extending the 24-in. pumping main from Pearl Ave. to Public Sq., $10,000 for improving pump house, enlarging flume, etc., $10,000 for building a concrete dam and $10,000 for repairs to reservoir, etc.

Catskill, N. Y.—The Lake Kiskatom Water Works & Electric Power Co. is stated to have presented to the Bd. of Water Comrs. a proposition to furnish Catskill with water by a gravity system.

Cohoes, N. Y.—It is reported that the Water Bd. has under consideration the matter of equipping the pumping station with new pumping machinery.

Oneida, N. Y.—The Bd. of Pub. Wks. is reported to be considering the construction of a reservoir back of the present one, at a cost of $50,000.

Penn Yan, N. Y.—The Village Bd. of Water & Sewer Comrs. is stated to have recommended the purchase of a new boiler.

Canton, O.—Bids will be received on Apr. 3 by the Bd. of Pub. Service (Chas. A. Zellars, Clk.) for the construction of a pumping station; estimated cost, $25,000. Architect, J. M. Bostick, of Massillon.

Cleveland Heights, O.—Bids will be received Apr. 11 by Wm. G. Phare, Clk. of Cleveland Heights, No. 402 American Trust Bldg., Cleveland, for $25,000 water works bonds.

Arcanum, O.—See "Power Plants, Gas and Electricity."

**Pittsburg, Pa.*—The T. A. Gillespie Co., of New York, N. Y., and Pittsburg, have secured the 10 contracts for the construction of the necessary works in connection with the proposed sand filtration system, bids for which were opened on Mar. 8 by the Bureau of Filtration, Dept. Pub. Wks. (Morris Knowles, Ch. Engr.).

Contract No. 1. Filters, Basins and Appurtenances.—T. A. Gillespie Co., $3,303,020; Daniel J. McNichol & Co., Philadelphia, $3,787,388, and Booth & Flinn, Ltd., Pittsburg, $3,551,491. The detail bid of the Gillespie Co. is substantially as follows: 600,000 cu. yd. general excav., 27 cts.; 72,000 cu. yd. excav. in trench, 65 cts.; 8,000 cu. yd. disposal of surplus material, 15 cts.; 316,000 cu. yd. embankment, 13 cts.; 245,000 cu. yd. fill over vaulting, 10 cts.; 48,000 cu. yd. puddle on premises, 95 cts.; 2,000 cu. yd. puddle off premises, $2.10; 11,000 cu. yd. broken stone for lining, $1.25; 2,500 cu. yd. broken stone or gravel for fill, 70 cts.; 16,000 sq. yd. slope paving $2.30; 105,000 cu. yd. concrete in floors and walls, $5.25; 10,000 cu. yd. concrete in piers, $6.75; 55,000 cu. yd. concrete in vaulting, $5.25; 2,135,000 sq. ft. arch centering, 7 cts.; 3,700 cu. yd. concrete in gate chambers, etc., $8.50; 12,400 cu. yd. reinf. concrete in cond. and drains, etc., $8.50; 2,400 cu. yd. concrete in trench, $4.50; 1,000 cu. yd. change in ratio of cement, 35 cts.; 1,220,000 lb. steel reinf., 2¼ cts.; 300 cu. yd. brick masonry $11; 16,000 sq. yd. waterproofing, Class A, 60 cts.; 1,500 sq. yd. waterproofing, Class B, 90 cts.; 46 filters, tile drains in piers, walls and vaulting, $60; 490 piers, iron pipe drains in piers of galleries, $2; 1,550 lin. ft. 96-in. steel pipe, ½-in. plate, $21; 820 lin. ft. 60-in. steel pipe, ⅜-in. plate, $12; 1,350 lin. ft. 57-in. steel pipe, ⅜-in., $11.50; 1,330 lin. ft. 54-in. steel pipe, ⅜-in. plate, $11; 1,700 lin. ft. 48-in. steel pipe, 5/16-in. plate, $9; 1,300 lin. ft. 42-in. steel pipe, 5/16-in. plate, $8; 160 lin. ft. 36-in. steel pipe, 5/16-in. plate, $8; 370 lin. ft. 30-in. steel pipe, ⅜-in. plate, $8; 1,450 lin. ft. 30-in. steel pipe, ¼-in. plate, $7; 150 lin. ft. 24-in. steel pipe, ¼-in. plate, $6; 43,000 lb. cast-steel specials, 12 cts.; 525 tons cast-iron pipe for general work, $43; 240 tons cast-iron hub-and-spigot specials (general work), $92; 335 tons cast-iron flanged special (general work), $115; 325 tons cast-iron pipe (high pressure), $45; 10 tons hub-and-spigot specials (high pressure), $95; 1 gate, 8-ft. 4-in. x 6-ft., hand op. sluice gates, $1,800; 1 gate, 6-ft. 8-in. x 6-ft. hand op. sluice gates, $1,800; 3 gates 6-ft. x 9-ft. motor op. sluice gates, $2,100; 2 gates, 6-ft. x 9-ft. hand op. sluice gates, $1,700; 3 gates, 6-ft. x 7-ft. motor op. sluice gates, $2,000; 1 gate, 5 ft. x 6-ft. motor op. sluice gates, $1,900; 4 gates, 60-in. circ. hand op. sluice gates, $1,000; 1 gate, 30-in. circ. hand op. sluice gates, $420; 6 gates, 24-in. hand op. sluice gates, $300; 46 doors, 5-ft. 3-in. x 7-ft. hyd. op. sluice doors, $1,200; steel drainage gates, $200; 56 sets steel hinged gates, $58; 10 M. ft. yellow pine lumber for stop plants, etc., $160; 8 36-in. stop valves, $380; 1 30-in. stop valve, $300; 231 20-in. stop valves, $110; 46 16-in. angle stop valves, $85; 4 10-in. stop valves, $35; 51 8-in. stop valves, $26; 31 6-in. stop valves, $17; 7 4-in. stop valves, $11; 24 3-in. stop valves and nipples, $7; 2,070 3-in. brass valves, $5; 284 indicator stands, etc., $18; 14 fire hydrants, $40; 46 inlet controlling valves, $350; 46 outlet regulating valves, $600; 23 sets indicating and recording ap. for each p'r filter, $450; indicating and recording ap. in admin. building, $750; 285,000 lb. w.-i. and steel work, 5 cts.; 40,000 lb. miscellaneous cast-iron work, 4 cts.; 28 manhole frames and covers, $8; 58 electric manhole frames and covers, $10; 41 pipe gallery manhole frames and covers, $7; 51 catch basin frames and covers, $13; 604 ventilator frames and covers, $17; 117 skylights, $75; 8 spiral stairways, $250; 4 sets ventilating machinery, $3,300; 2,500 sq. ft. gallery partitions, 60 cts.; 7,500 lin. ft. pipe railings, 85 cts.; gallery furniture, lockers, etc., $2,300; 23,000 sq. yd. painting subway and pipe gallery, 14 cts.; steam pipe system, $13,000; exterior gas pipe system, $1,410; 2,000 lin. ft. lead-lined iron pipe, 55 cts.; 67,000 duct. ft. terra cotta duct conduits, 10 cts.; 7,500 duct ft. lap-welded steel pipe ducts, 40 cts.; high-tension arc cables, lamps, poles, $5,485; exterior low-tension wiring and cables, $16,000; 8 gallery switchboards $200; 46 filter switchboards, $90; 8 gallery wiring and lighting system, $1,650; 46 filters, filter wiring and lighting system, $1,400; telephone cables, wiring, etc., $2,000; central telephone switchboard, $425; telephones, $600; cables and wiring for clock and patrol box system, $3,500; time-clock system, $1,060; patrol box system, $1,300; 46 lateral tile collectors, $530; 55,000 cu. yd. filter gravel, $1; 219,000 cu. yd. filter sand, 85 cts.; 8 12-in. Venturi meters, $800; 3,250 lin. ft. 12-in. lap-welded steel pipe, $3.50; 3,600 lin. ft. 8-in. lap-welded steel pipe, $1.90; 8,000 lin. ft. 6-in. lap-welded steel pipe, $1.10; 50,000 lin. ft. 5-in. lap-welded steel pipe, 85 cts.; 160,000 lin. ft. 3-in. lap-welded steel pipe, 47 cts.; 120 lin. ft. 10-in. spiral riveted steel pipe, $4; 1,650 lin. ft. 8-in. spiral riveted steel pipe, 90 cts.; 1,200 lin. ft. 4-in. spiral riveter steel pipe, 50 cts.; 7,800 lin. ft. 3-in. flexible hose, $2.75; 2,100 lin. ft. 3-in. flexible hose, with coupling, $1.25; 1,800 lin. ft. 4-in. flexible hose, with coupling, $1.75; 4 hose connections $35; 8,500 3-in. composition male hose connections, $1.20; 6,900 3-in. composition female hose connections, $2.20; expansion ring apparatus and hose span, $60; 15 sets sand washer apparatus, $1,200; 15 portable sand ejectors, $55; 46 filters, flat-bar track system, $1,300; 46 standard T-rail track system, $3,000; 8 sand restoring tanks, $300; 12 sand scraping machines, $7,250; 6 sand restoring machines, $8,940; 30,000 sq. yd. telford-macadam roadways, $1.20; 3,000 sq. yd. macadam paths, 60 cts.; 1,000 lin. ft. concrete curbs and gutters, 60 cts.; 4,000 sq. yd. paved gutters and channels, $2.40; 1,100 lin. ft. 20-in. terra cotta drain pipe, $1; 600 lin. ft. 18-in. drain pipe, 90 cts.; 500 lin. ft. 15-in. drain pipe, 70 cts.; 400 lin. ft. 10-in. drain pipe, 50 cts.; 2,800 lin. ft. 8-in. drain pipe, 40 cts.; 100 lin. ft. 6-in. drain pipe, 25 cts.; 300 lin. ft. 4-in. drain pipe, 20 cts.; portable derrick, $175; 2 trolley cranes in gate room, $575; 2 impeller pumps in gate room, $640; portable sump pump, $220; refrigerating apparatus, $2,500; laboratory, $2,900; administration building, complete, $53,380; superintendent's house, complete, $13,140; stable, complete, $19,023; 2 concrete arch bridges, $3,250; 8 concrete entrances to galleries, $1,600; 4 gate entrances, $2,120; 10,000 lin. ft. hedges, 10 cts.; general planting, $5,300; 80 acres seeding, $47; 7,000 sq. yd. sodding, 30 cts.; support of tracks, pipe across rights of way, $15,000.

Contract No. 2. Filtered-Water Reservoir and Appurtenances.—Gillespie Co., $417,006; McNichol & Co., Philadelphia, $501,066; Booth & Flinn, $475,591, and J. McNally & Co., Pittsburg, $423,120. The bid of Gillespie Co. is as follows: 130,000 cu. yd. general excav., 30 cts.; 1,500 cu. yd. excav. in trench, 70 cts.; 180,000 cu. yd. embankment, 25 cts.; 26,000 cu. yd. fill, 30 cts.; 15,000 cu. yd. general fill, 12 cts.; 2,000 cu. yd. puddle, Class A, 85 cts.; 14,000 cu. yd. puddle, Class B, $1.75; 3,400 cu. yd. broken stone or gravel fill, 50 cts.; 5,700 cu. yd. slag or gravel lining in revetment, 50 cts.; 3,400 lin. ft. timber piles, 40 cts.; 20 M. ft. timber for footing, $40; 10,500 cu. yd. concrete in walls and floors, $5.40; 2,500 cu. yd. concrete in piers, $6.40; 1,100 cu. yd. reinforced concrete in piers, $15; 6,200 cu. yd. concrete in vaulting, $4.70; 243,000 sq. ft. arch centering for vaulting, 8½ cts.; 1,500 cu. yd. concrete in gate chamber, $7; 1,600 cu. yd. reinforced concrete in conduits and drain, $7; 130 cu. yd. concrete in trench, $7; 3,600 cu. yd. concrete in revet. slope paving, $7; 100 cu. yd. change in ration of cement, 35 cts.; 217,000 lb. steel reinf. in conduit and drain, 2¼ cts.; 354,000 lb. steel reinf. in vaulting, 2¼ cts.; 14,000 lb. misc. steel reinf., 2¼ cts.; 50 cu. yd. brick masonry, $12; 140 tons c.-i. hub-and-spigot pipe, $45; 8 tons c.-i. hub-and-spigot specials, $100; 24 tons c.-i. flanged pipe and specials, $120; 1 6 x 9-ft. motor oper. sluice gate, $2,200; 3 6 x 8-ft. motor oper. sluice gates, $2,200; 2 6 x 7-ft. motor oper. sluice gates, $2,000; 1 30-in. circ. hand oper. sluice gate, $475; 1 24-in. circ. hand oper. sluice gate, $320; 10 M. ft. yellow pine lumber, etc., $150; 3 24-in. stop valves, $200; 4 12-in. stop valves, $75; 3 6-in. stop valves, $35; 5 fire hydrants, $40; steel weir, etc., $140; measuring apparatus, $150; 17,000 lb. miscel. w.-i. and steel work, 5 cts.; 20,000 lb. miscel. c.-i. work, 4 cts.; 26 sets ventilat. frames and covers, $18; 385 lin. ft. gas pipe and fittings, 25 cts.; 65 lin. ft. lead-lined iron pipe and fittings, 70 cts.; 17,000 duct. ft. t. c. duct conduits, 10 cts.; 500 lin. ft. lap-welded steel pipe ducts, 40 cts.; exterior wiring, poles, lamps, etc., $1,850; telep. and patrol cables and connections, $1,000; indic. transm, and recording gauge, $400; 3,600 sq. yd. telford-macadam roadways, $1.10; 44 sq. yd. paved gutters, $2.30; 33 lin. ft. 24-in. t. c. drain pipe, $1.70; 145 lin. ft. 15-in., 60 cts.; 345 lin. ft. 12-in., 45 cts.; 300 lin. ft. 10-in., 40 cts.; 300 lin. ft. 8-in., 25 cts.; 400 lin. ft. 6-in., 20 cts.; 10,000 lin. ft. 2-in. agricultural drain pipe, 2½ cts.; inlet gate house, $4,500; outlet gate house, $4,900; 2 hand-trolley cranes, $500.

Contract No. 3. River Crossing and Connections at Brilliant Pumping Station and Appurtenances.—Gillespie Co., $207,373; McNichol & Co., $249,207; Booth & Flinn, $192,950; and Dravo Co., $193,719. The bid of the Gillespie Co. follows: Excav. in river section$12,826; 4,400 cu. yd. excav. on land section and in Brilliant Pump. Sta., 81 cts.; cofferdam, $18,900; 16,000 lin. ft. timber piles, 34 cts.; 84 M. ft. sheet piles, $70.50; 26 M. ft. yellow pine lumber, $105; 1,200 cu. yd. riprap stone, $3.80; 3,000 cu. yd. concrete in river crossing, $5.05; 800 cu. yd. concr. in Brilliant Pump. Sta., $5.80; 400 cu. yd. reinforced concr. $11; 100 cu. yd. change in ratio of cement, 31 cts; 7,300 sq. ft. expanded metal, 13 cts.; 20,000 lb. miscel. steel reinforcem., 2½ cts.; 30 cu. yd. brick mas. and paving, $13.65; 2,600 lin. ft. 72-in. steel pipe, ½-in. thick, $22.70; 92,000 lb. miscel. steel stop valve, $882; 2 30-in. hydr. lift. flange stop valve, $567; 3 6-in. flange or bell stop pipe, 6.8 cts.; 6,600 lb. steel castings, 15 cts.; 30 tons c.-i. hub-and-spigot pipe and specials, $53; 58 tons c.-i. flange pipe and specials, $145; 20,000 lb. miscel. w.-i. and steel, 5 cts.; 50,000 lb. miscel. c.-i. work, 5 cts.; 1 6x8-ft. hand oper, sluice gate, $2,016; 2 72-in. circ. hand oper. sluice gate, $1,512; 1 7-h.p. air motor, $250; 1 42-in. hydr. lift, flange stop valve, $1,260; 4 36-in. hydr. lift. flange valves, $25; 5 4-in. flange stop valves, $25; 2 72-in. Venturi meters, $3,150; 1,400 lin. ft. lead-lined iron pipe, 52 cts.; indicating and recording gauge, $126; 1,500 lin. ft. telephone cable, 33 cts.; 1 centrifugal pump, $365; 3 lifters, stop plank lifters, $50; 1,200 cu. yd. removing masonry, $8.20; removing pipes, screens, floors, etc., $2,520; pump. and clean. wet walls at Brilliant Pump. Sta., $756; replac. pipes, floors, etc., $3,276; supp. and moving existing machinery, $1,038; surface condensers, $10,580.

Contract No. 4. Centrifugal Pumps, Engines, and Appurtenances.—Gillespie Co., $89,600; McNichol & Co., $88,800; Booth & Flinn, $86,680; Allis-Chalmers, Co., Milwaukee, Wis.,

**Items marked thus give the names of parties awarded contracts.*

$81,600, and Wm. Tod Co., Youngstown, O., $102,400. The bid of the Gillespie Co. is as follows: 4 35-million gallon centrif. pumps, 46-ft. head, $6,800; 4 comp. condensing eng. 600-h.p., $11,700, and 4 condensers and air pumps, $3,900.

Contract No. 5. Boilers, Economizers, Piping and Appurtenances.—Gillespie Co., $66,950; McNichol & Co., $66,426; Booth & Flinn, $55,930; Babcock & Wilcox Co., Pittsburg, $66,920; Aultman-Taylor Co., Pittsburg, $62,662; Heine-Safety Boiler Co., Pittsburg, $53,939, and Erie City Iron Works, Erie, $58,495. The bid of the Gillespie Co. is as follows: 8 water-tube boilers, etc., 350-h.p., each, $5,650; 8 mechanical stokers, $1,475, and 2 fuel economizers, 360 tubes, each, $4,975.

Contract No. 6. Sand Washer Pumps, Electric Machinery, Auxiliary Equipment and Appurtenances for New Pumping Station.—Gillespie Co., $119,200; McNichol Co., $139,588, and Booth & Flinn, $135,434. The bid of the Gillespie Co. follows: 2 5-million-gal. wash water pumps, $10,900; 1 3-million-gal. wash water pump, $7,500; 2 motor-driven air pumps, $2,000; 3 direct current gen. sets, $6,090; 1 motor-driven arc light gener., $2,420; 1 set condensing apparatus for eng. for gen. sets, $4,250; switch board, etc., $3,318; 1 motor-driven triplex boiler feed pump, $1,100; 1 duplex boiler-feed steam pump, $500; 2 filtered water supply steam pumps, $450; 1 12-in. centrifugal circ. pump, motor, etc., $1,700; 1 6-in. centrifugal sump. pump, motor, etc., $680; 1 2-in. centrifugal sump. pump, motor, etc., $390; steam piping valves, etc., $12,112; exhaust piping valves, etc., $3,950; boiler feed valves, etc., $3,133; drip piping, traps, valves, $790; blow-off piping valves, $905; cold water piping valves, $9,000; lead-lined w.-i. pipe, $250; oiling system, $1,569; 4 feed water filters, etc., $537; 1 electric traveling crane, $3,200; 1 electric locomotive, $3,285; 1 ash car, $1,000; 1 track hopper hatch, $320; 8 weighing coal hoppers, $350; weighing tanks, $150; special gauges, $260; 1 24-in. engine lathe, $1,660; 1 12-in. engine lathe, $770; 1 12-in. speed lathe, $500; 1 10-in. pipe machine, $1,635; 1 25-in. upright drill press, $533; 1 24-in. shaper, $1,370; grinding machinery, $488; 1 pipe rack, $150; forge, anvil, etc., $352.

Contract No. 7. Pumping Station and Appurtenances.—Gillespie Co., $344,532; McNichol & Co., $380,296; Booth & Flinn, $362,400; Dravo Co., $363,580; Henry Shank & Co., Pittsburg, $373,029, and the A. & S. Wilson Co., Pittsburg, $407,923. The detail bid of the Gillespie Co. follows: 16,000 cu. yd. excav., 52 cts.; 13,000 cu. yd. fill, 20 cts.; 13,000 cu. yd. concrete in foundation, $4.40; 600 cu. yd. reinforced concrete, $7.30; 400 cu. yd. non-reinforced concrete, $4.20; 2,000 sq. yd. granolithic surfacing, etc., 52 cts.; 57,000 lb. steel reinforce. in concrete, 2¼ cts.; 60 cu. yd. misc. brick masonry, etc., $9; c.-i. drains and appurt., $735; 30 M. ft. sheeting and shor. left in place, $38; coal and ash handling appurt., $10,200; track scales, etc., $1,300; stone mas'ry in superstructure, $55,000; brick mas'ry in superstructure, $52,000; chimney, $23,400; structural steel, cast iron, etc., $44,700; carpenter work, wood finishing, etc., $6,100; tile roofing, etc., $11,500; sheet and ornamental metal work, $38,000; plastering, $8,500; floors, marble, slate, etc., in office, $1,200; elec. ducts, wiring, fixtures, etc., $5,000; plumbing, fixtures and appurt., $1,700; heating apparatus, fixtures, etc., $2,600; hardware and appurt., $230; painting, glazing, etc., $3,300.

Contract No. 8. River Wall, Intakes, Connections and Appurtenances.—Gillespie Co., $212,647; McNichol & Co., $208,552; Booth & Flinn, $228,538, and Dravo Co., $229,338. The bid of the Gillespie Co. follows: 9,700 cu. yd. gen'l excav. $1.75; 3,000 cu. yd. excav. in cofferdam, $1.75; 54,000 cu. yd. embkmt., class A, 26 cts.; 127,000 cu. yd. embkmt., class B, 41 cts.; 2,200 cu. yd. slag or gravel lining of revetment, 45 cts.; cofferdam, $3,450; 1,300 lin. ft. timber piles, 34 cts.; 8 M. ft. timber for footing, $40; 230 cu. yd. concrete in floors, $4.60; 320 cu. yd. concrete in walls, $7; 2,500 cu. yd. concrete in intake, $6; 830 cu. yd. concrete, reinforced, $6.70; 220 cu. yd. concrete in trench, $3.70; 1,200 cu. yd. concrete in revetment, $5.10; 100 cu. yd. change in ratio of cement, 35 cts.; 96,000 lb. steel reinf. in conduits, etc., 2¼ cts.; 40 cu. yd. brick mas'ry, $9.75; 750 sq. yd. waterproofing, Class A, 55 cts.; 140 sq. yd., waterproofing, class B, 90 cts.; 360 lin. ft. 96-in. steel pipe, ½-in. plate, $25; 365 lin. ft. 36-in. ⅜-in. plate, $8.40; 300 lin. ft. 30-in., ⅜-in. plate, $7.40; 770 lin. ft. 30-in., ¼-in. plate, $6; 9,600 lb. c. steel specials, 16 cts.; 1 96-in. Venturi meter, $3,100; 65 tons c.-i. hub-and-spigot pipe, $38.50; 4.3 tons c.-i. hub-and-spigot specials, $86; 80 tons c.-i. flanged pipe and specials, $103; 2 6x9-in. hand op. sluice gates, $1,730; 8 48-in. circ. hand op. sluice gates, $660. Valves.—8 36-in. disc, $210; 8 24-in. hand oper. fl. stop, $165; 6 18-in. stop, $110; 1 10-in. stop, $35; 2 8-in. stop, $24; 5 6-in. stop, $19; 4 36-in. motor op. stop, $865; 2 30-in. motor op. stop, $650; 1 30-in. motor op. stop, with 6 in. plug, $600; 1 72-in. hyd. op. stop, with 8 in. by pass, $3,500; 1 36 in. hyd. op. stop, with 6-in. by-pass, $700; 4 48-in. check, $1,350. 2 fire hydrants, $40; 18,000 lb. misc. w. i. and steel work, 3½ cts.; 6 standard M. H. frames and covers, $8; 6 electric M. H. frames and covers, $11; 6 catch basin M. H. frames and covers, $13; 360 lin. ft. pipe railings, 80 cts.; steam piping system, $2,000; 270 lin. ft. exterior gas pipe system, 85 cts.; 470 lin. ft. lead lined w.-i. pipe, 50 cts.; 10,000 duct ft. t. c. duct conduits, 9 cts.; 1,700 duct ft., lap welded steel pipe ducts, 37 cts.; high ten. arc cables, lamps, poles, $1,600; exterior low ten. wiring cables, $2,600; tel. and patrol wiring and cables, $360; propeller pump, $1,800; 2,600 sq. yd. telford-macadam, $1.15; 220 sq. yd. granolithic paths, $1.60; 2,700 lin. ft. concrete curbs and gutters, 66 cts.; 400 lin. ft. 8-in. terra cotta drain pipe, 22 cts.; 2,500 lin. ft. standard gauge R. R. siding, $2.30.

Contract No. 9. Pumping Engines, Boilers and Appurtenances at Brilliant Pump Station. Gillespie Co., $217,840; McNichol & Co., $236,524; Booth & Flinn, $210,709; Allis-Chalmers Co., $210,900; Wm. Tod Co., $214,200, and Camden Iron Wks., Philadelphia, $236,400. The bid of the Gillespie Co. is as follows: 2 15-million-gallon crank and fly wheel pumping engine, 360, $87,500; 3 water-tube boilers, 500-h.p., each, $7,950; 3 stokers, etc., $2,320; coal handling machinery, etc., $5,830; flue and connections, etc., $1,200, and piping in boiler room, $5,000.

Contract No. 10. Pipe Line and Appurtenances, Highland Reservoir, No. 2, South Side.—Gillespie Co., $489,826; McNichol & Co., $511,142; Booth & Flinn, $477,544 and O'Herron & McQuade, Pittsburg, $528,570. The detail bid of the Gillespie Co. follows: 4,500 cu. yd. excav. in Highland Park, 41 cts.; 4,500 cu. yd. excav., extra, in streets, 84 cts.; 100 cu. yd. rock excav., $4.83; 12,000 cu. yd. rolled embkmt., Highland Park, 37 cts.; 1,700 lin. ft. 50-in. steel pipe, ⅜-in. $10,06; 16,600 lin. ft. 50-in., $11.83; 8,000 lin. ft. 50-in., ½ in thick, $13.83; 3,000 lin. ft. 36-in., ⅜ in. thick, $9.73; 1,100 lin. ft. 36-in. double riveted steel pipe, ½-in., $22.25; 200 lin. ft. extra heavy 4-in. w.-i. pipe, $1.75; 60 tons c.-i. hub-and-spigot pipe, $42; 35 tons c.-i. hub-and-spigot specials, $75.35; 10 tons c.-i. flanged pipe and specials, $118.34; 1 48-in. Venturi meter, $3,625; 1 36-in. Venturi meter, $2,175. Stop valves with by-pass gear.—1 42-in., bev. gear, $921; 4 36-in., bev. gear, $654; 3 30-in., bev. gear, $452; 2 24-in., spur gear, $265; 3 20-in., spur gear, $161; 1 18-in., spur gear, $161; 2 10-in., without gears, $42,25; 6 8-in., $36.25; 2 6-in., $30.20; 11 1½-in. air valves, $36. 8 chambers for 42-in., 36-in., 30-in. valves, $169; 6 chambers for 24-in., 20-in., 18-in. valves, $107.50; 18 chambers for 16-in. and smaller valves, $54.50; 33 brick manholes, $56; 100 cu. yd. concrete in culverts, pump cham., $6.65; 4,000 cu. yd. concrete in trench around pipe, $5.10; 1,000 cu. yd. concrete around pipe-river cross., $5.36; steel pump chamber, $1,840; 1,500 lin. ft. timber piles, 32 cts.; 5 M. ft. lumber in caps, platf.-cradles, $42; 4,900 lin. ft. moving 12-in., 10-in., 8-in., 6-in. and 4-in. c.-i. pipe, 10 cts.; resetting fire hydrants, $12; 60s. changing water services, 2-in and smaller, $4.80; 60s. changing gas services, $6; 400 lin. ft. 15-in. terra cotta pipe, 36 cts.; 700 lin. ft. 10-in. terra cotta pipe, 32 cts.; 1,000 lin. ft. 8-in., 6-in. and 4-in. terra cotta pipe, 25 cts.; 6 large catch basins, $60; 5 small catch basins, $30; 2,500 lin. ft. resetting curbing, 15 cts.; 20,000 sq. yd. asphalt paving, $2.30; 800 sq. yd. relaying stone paving, $1.25; 2 acres seeding, $36; 800 sq. yd. sodding, 60 cts.; 200 sq. yd. macadam path, 73 cts.; extra crossing steam R. R. tracks, lump sum, $7,245; extra work-houses, Boundary St. and Schenley Es., lump sum, $895; extra work prop., Jones & Laughlin Steel Co., lump sum, $7,245.

Reading, Pa.—It is stated that bids will be received until Mar. 21 by the Bd. of Water Comrs., for c.-i. pipe, special castings, gate boxes, water gates, fire hydrants, and for laying water pipes for the fiscal year 1905-1906. Emil L. Nuebling, Supt. & Engr. Water Wks.

Saxton, Pa.—W. E. Brunman, Secy. Boro. Council, writes that it has not yet been decided whether to construct water works; if constructed the probable cost of the work will be $20,000.

Lock Haven, Pa.—The City Council is stated to have granted the West End Water Co. permission to lay water mains through certain streets of the city in order to reach Flemington and Mill Hall.

Williamsport, Pa.—Local press reports state that the Williamsport Water Co. has passed a resolution appropriating $25,000, to be expended in the installation of a Worthington water force pump.

Parkston, S. D.—The citizens are reported to have voted Mar. 1 to construct water works.

Toronto, S. D.—There is some talk of constructing water works here.

Clarksville, Tenn.—Bids will be received on Apr. 3 by the Water Com. (Z. Dean, Chm.) for a pumping engine of 2,000,000 gal. daily capacity, as advertised in The Engineering Record.

North Ft. Worth, Tex.—Bids will be received Mar. 25 by L. G. Pritchard, Mayor, and the City Council, for furnishing material and constructing water works, including brick or concrete pump house and stack, pumping plant, including 2 engines, capacity, 1,000,000 gal. per 24 hours; 2 boilers, piping and appurtenances, 1,200 tons 6 to 12-in. c.-i. pipe, special castings, about 74 gate valves and boxes, 83 fire hydrants, a covered reservoir, capacity 500,000 U. S. Gal., to be constructed of concrete and a standpipe, or an elevated tank. J. M. Hall, City Engr.

Bristol, Vt.—A committee is stated to have been appointed, with F. G. Hopkins as chairman, to employ an engineer to make survey, estimates, etc., for a gravity system of water works.

Colville, Wash.—Water bonds to the amount of $12,000 are reported sold. W. H. Jackson, Town Clk.

Prescott, Wash.—It is reported that it is proposed to issue $7,000 bonds for water works.

**Seattle, Wash.*—The contract for water main in Dorffel Drive (bids opened Mar. 4) has been awarded to Puget Sound Bridge and Dredging Co., 95 Yester Way, for $5,224.

Wheeling, W. Va.—At a recent meeting of the Council Com. on Water Wks. and the City Water Bd., the following recommendations are reported to have been decided upon: The purchase of 2 batteries of tubular boilers of 300 h.p. each, to erect addition to present boiler shed, and to install a duplicate line of steam pipe from boilers to pumping engines; also that the Water Bd. engage a hydraulic engineer, not connected with any manufacturing company, to make a complete examination of city's water service, and make suggestions as to what is necessary together with the estimated cost of putting present water system in perfect condition.

Mayville, Wis.—The question of constructing water works is reported under consideration here, to cost $37,000. Mr. Byron, Mayor.

De Pere, Wis.—M. J. Maes, City Clk., writes that W. G. Kirchoffer, of Madison, is engineer for the proposed water works.

St. John, N. B.—The General Com. of Common Council is reported to have under consideration the construction of a lake or reservoir on Mispec River, to take 7,750,000 gal. of water daily from that stream.

Toronto, Ont.—The date of opening of bids for a 5 or 6 million imperial gallon triple-expansion, flywheel pumping engine for the Water Works Dept., has been extended from Mar. 21 to Apr. 18, as advertised in The Engineering Record.

Westmount, Que.—See "Power Plants, Gas and Electricity."

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

See also under "Civil Sundry Appropriations."

West End, Ala.—The citizens are reported to have voted to issue $15,000 bonds for the construction of sanitary sewers and bids for these bonds will be received by P. S. Milner, Chmn. Finance Com., on Mar. 21.

San Bernardino, Cal.—The City Trus. are reported to have under consideration the construction of about 4 miles of sewers in the section north of the Sante Fe shops.

**Washington, D. C.*—Hiram W. Phillips, of Quincy. Mass., is stated to have secured the contract for constructing 2 siphons for the sewage disposal system across Anacostia River (bids opened Mar. 6) for $41,598.

Logansport, Ind.—W. A. Osmer, City Engr., writes that the probable cost of the West Side sewers, bids for which will be received by the City Clk. on Apr. 5, will be from $75,000 to $100,000.

Marion, Ind.—It is stated that bids will be received until Mar. 21 for constructing a sanitary sewer. John O. Willson, City Clk.

Richmond, Ind.—It is reported that bids will be received Apr. 3 by John F. Taggart, City Clk., for constructing a sewer in alley bet. 6th and 7th Sts.; also for grading, graveling and bouldering said alley.

Des Moines, Ia.—John W. Budd, City Engr., writes that the following are the bids opened on Mar. 11 by the Bd. of Pub. Wks., for constructing Ingersoll Run sewer (bidders all of Des Moines): Christy Constr. Co., $60,000; O. P. Herrick, $63,000; J. C. Lukes, $61,974; W. F. Cook, $61,000; Wm. Horrabin, $33,459; J. W. Turner, $55,972; Des Moines Bridge & Iron Wks., $56,418; J. F. Griffith & Co., $60,759, and King, Lambert Constr. Co., $59,954.

Ashland, Ky.—Bids will be received Mar. 21 by Chas. D. Boggess, City Engr., for constructing sewers in portions of 23d and 19th Sts., Carter and Montgomery Aves; requiring approximately 2,332 ft. 10, 12, 15, 18 and 24-in. pipe sewer, 16 Y's 6x24 in., 3 Y's 10x24 in. and 18 Y's 6x18 in., 4 manholes, 8 catch basins, etc.

Louisville, Ky.—City Engr. Breed is reported to be completing plans for the proposed main sewer which is to drain South Louisville. Under the survey the sewer will begin at Ohio River, near mouth of Upper Paddy's Run, about 100 ft. south of Gibson's Lane if extended; the total cost of the work will be about $1,500,000.

Easthampton, Mass.—At the town meeting Mar. 13, it was voted to appropriate $15,000 for the construction of a sewer main in the vicinity of Parson and Franklin Sts., and $1,800 for a start on the construction of the sewer filtration beds.

Watertown, Mass.—Fred. E. Critchett, Town Clk., writes that it is proposed to construct an outfall drain, at a cost of $7,500.

Lansing, Mich.—The Council has under consideration the construction of 6,274 ft. of sewers in the 1st Ward; the sizes vary from 2x3 ft. to 4x6 ft.; probable cost, $30,500. H. A. Coller, City Engr.

Grand Rapids, Mich.—Local press reports state that City Engr. L. W. Anderson has been asked to prepare estimates for sewers in the 3d and 10th Wards.

Menominee, Mich.—Bids are wanted Apr. 10 for constructing sewers in numerous streets, as advertised in The Engineering Record.

Minneapolis, Minn.—It is stated that bids will be received until Mar. 31 for furnishing the following materials, to be used in sewer brick, special castings, and vitrified clay pipe. Andrew Rinker, City Engr.

Springfield, Minn.—See "Water."

Kirkwood, Mo.—Bids will be received until Apr. 3 by the Bd. of Aldermen, for constructing public and district sewers and septic tanks. J. G. Hawken, City Clk.

Trenton, N. J.—Bids will be received Mar. 21 by the Common Council, for constructing a drain in a portion of Ewing St. Harry B. Salter, City Clk.

Atlantic City, N. J.—Bids will be
by the City Clk., on Mar. 27, for cons
inlets and drains, as advertised in T
neering Record.

Asbury, Park, N. J.—The State
Comn. is stated to have approved th
of Engr. Snow for a sewage disposal
Asbury Park, to cost about $40,000.
tic tank system will be used. John J.
Supt. Dept. Water & Sewers, 711
Ave.

Syracuse, N. Y.—Contracts will
soon be let for constructing the 10t
sewer, consisting of brick and tile,
in. to 15-in. diam.; estimated cost, $

New Rochelle, N. Y.—Bids will be
Mar. 21 by Chas. Kammermayer, Ci
for $97,000 sewer bonds.

**Columbus, O.*—Bids were opened on
by the Bd. of Public Service (Julian
Ch. Engr.) for furnishing material a
structing the main sewage pumping
The contractors are all of Columbus a
submitted 2 bids as follows: West
Casey, $61,013 (awarded contract) a
713; The Buckeye Engr. and Constr. C
865 and $68,165; Fisher & Knight, $
and $75,338.

Bids will be received by the
Pub. Service on Mar. 29 for const
by use of trenching machinery, Sect.
the Central Relief Sewer, as advertised
Engineering Record.

The City Council on Mar. 6 pass
ordinance appropriating $150,000 f
Jackson Pike and Remck sewers a
Eldon Ave. storm water sewer.

The Fin. Com. of Council on Mar. 10
priated $25,000 for repairs to the Ind
Peters Run and Hudson St. sewer and
also $18,000 for a sanitary sewer to
the territory adjacent to Hoosac St.

Monroe, O.—Press reports state th
city will expend about $100,000 in se
improvements.

Warren, O.—E. M. Milligan, City
writes that it is proposed to construct a
sewer in Mahoning Ave. to cost $8,0
will be of vitrified pipe, 18 and 15-in
During the summer 6,500 ft. 12-in.
will be constructed in various other str

Monroeville, O.—This city is repor
be considering the subject of sewerage

Cleveland, O.—Bids will be receive
23, by the Bd. Pub. Service for const
sewers in portions of Detroit, Milfor
Ross Sts. A. R. Callow, Secy.

**Wilkesbarre, Pa.*—W. Y. Ingham,
Engr., writes that contract for sewers
opened Feb. 24) have been awarded
lows:

*For trenching: To Grossart, Pascoe
Allentown, Division No. 1, $23,166;
Rosser, Kingston, Pa., Divisions Nos.
$12,903, $13,963 and $14,337, respe
and Hawman Bros., Reading, Divisio
3 and 5, $11,639 and 13,847, respective

*Pipe and fittings: Geo. N. McA
Wilkesbarre, Divisions No. 2-4, $4,0
$4,196, respectively; J. A. Hutchins
Wyoming, Division No. 3, $1,414; Ro
Clay Co., Akron, O., Division No. 5,
and Mack Mfg. Co., Philadelphia, Pa.
sion No. 6, $5,349.

Division No. 7 was not awarded a
of the property owners failed to sign r
The lowest bid on this division for tre
was that of Hawman Bros., of Readi
$16,368 and the lowest bid for pipe a
tings for this division was that of the
Clay Mfg. Co., of Patton, for $3,094.

Media, Pa.—Wm. H. Fricken, Tow
writes that there will not be any sew
in this town for several years.

Dravosburg, Pa.—Bids are wanted
for constructing a brick sewer in McCl
and 2 terra cotta sewers in Maple a
quesne Aves., respectively. White &
Boro. Engrs., 424 Fourth Ave., Pit
Courtney L. Whitaker, Boro. Clk.

Seattle, Wash.—The City Counc
passed an order providing for the co
tion of a sewer on 2d Ave., W., at a
$18,800.

Bids will be received Mar. 25 by
Bagley, Secy. Bd. Pub. Wks., for const
a main trunk sewer in Rainier Ave.
mated cost, $87,000; approximate e
of quantities: 6,507 lin. ft. 48, 54,
72 and 75-in. circular brick sewer; 1,5
ft. 32x48-in. 2,670 lin. ft. 30x45-in. a
lin. ft. 24x36-in. oviform brick sew
4½-ft. manholes, 17 special manholes,
holes to be lowered, etc.

BRIDGES.

Notes Arranged Alphabetically by St

Birmingham, Ala.—Bids are wanted
for constructing a permanent floor f
St. bridge, either of reinforced concret
creosoted wooden block, brick, asph
bituminous macadam wearing surface,
creosoted wooden block paving on cr
stringers; length, 1,000 ft.; driveway,
Julian Kendrick, City Engr.

Sacramento, Cal.—The Senate is st
have passed a bill providing for an app
tion of $6,000 for bridge work on Lake
wagon road.

A bill is stated to have been passed
Assembly providing for an appropria
$20,000 for constructing bridges, culve
grading on Sonora and Morro Roads.

Atlanta, Ga.—Bids are wanted Apr
the completion of the Edgewood Ave.
to be constructed with reinforced conc
advertised in The Engineering Record

Items marked thus give the names of parties awarded contracts.

.—Bids will be received Mar. 23
Pub. Wks., for furnishing mate-
ructing superstructure of North
over north branch of Chicago
ing machinery, locks, electrical
perator's houses, etc., necessary
id bridge; bids will also be re-
me date for constructing sub-
d approaches for said bridge.
, Comr.

s, *Ind.*—Bids will be received
Bd. Co. Comrs., for a retaining
Creek Bridge, on White River,
on Township, Cyrus J. Clark,

nd.—It is stated that bids will
Apr. 6 by C. S. Brineman, Co.
nstructing a 160-ft. iron bridge
ay River, in Wells Co.; bids will
ved on same date for constructing
concrete bridges.

Ind.—It is stated that the
'ayne County will soon ask bids
ting a bridge over Whitewater
chmond.

Kan.—The Leavenworth Bridge
ed to have received the contract
ing a bridge over the Kaw River,
or about $25,000.

y.—It is reported that bids will
Mar. 28 by the Louisa & Ft. Gay
at Louisa, for constructing a
Big Sandy River, bet. Louisa and
Va.

, *Ky.*—It is reported that bids
ived Apr. 5 by Thos. Evans, Co.
constructing a steel bridge over
s, in Livingston Co.

eans, La.—W. W. Bierce Co., Ltd.,
ans, is stated to have received the
constructing a viaduct over the
he Morgan, Louisiana & Texas
wton St., in Algiers, for $54,760.

Minn.—W. S. Hewitt & Co., of
, is stated to have received the
constructing a bridge over Zum-
or $6,890.

usta, Miss.—See "Public Build-

n, Mo.—It is reported that bids
received Apr. 6 by A. W. Weh-
constructing a steel bridge 124
r Charrette Creek.

es, Mo.—The House of Represen-
tated to have passed a bill author-
Missouri Central Ry. Co. to con-
idge over Missouri River near St.

leasant, N. J.—The contract for
Point Pleasant Bridge over the
iver is stated to have been award-
New Jersey Bridge Co., of Manas-
14,740.

k, N. Y.—The Bd. of Aldermen on
lopted the report of the Fin. Com.
the resolution giving Bridge Comr.
000 for the projected temporary
improve conditions at the Brook-

O.—Plans are stated to have been
y the Big Four R. R. Co. (G. W.
Ch. Engr., Cincinnati) for a double
ge to be constructed over Black
rafton, at a probable cost of $25,-

, *O.*—The Bd. of Pub. Service is
have awarded to the Newcastle
, of Indianapolis, the contract for
g an iron bridge over the Miami
necting Riverdale and North Day-
7,800.

er, Pa.—The Clerk of the County
ites that this county has no new
nder consideration at the present

Pa.—The County bridge between
and and Armstrong Counties is re-
troyed by the flood. Greensburg C.
oreland Co.

Pa.—Nelson Buchanon Co., of
burg, is stated to have received the
or constructing 9 bridges on the line
ttsburg, McKeesport & Greensburg
., between Irwin and Trafford City.
ble cost of proposed improvements
e, it is reported, is $250,000.

ewickley, Pa.—The construction of
over Beaver River between Law-
Beaver Counties, is reported under
ion; estimated cost, $50,000. (Bea-
, Beaver County.)

ockton, Tex.—John M. Odom, Co.
ites that the contract for construct-
on bridge across Pecos River, near
(bids opened Feb. 14), has been
to Texas Bridge Co., of Dallas, for

hee, Wash.—The construction of a
n bridge 1,190 ft. long over the
River, is reported under considera-
bable cost, $50,000.

eg, Man.—Bids will be received un-
25 by J. E. Schwitzer, Div. Engr.,
Pacific Ry. Co., Winnipeg, for con-
several concrete arches and culverts
line.

ING AND ROADMAKING.

Arranged Alphabetically by States.

so under "Civil Sundry Appropria-

er, Ala.—Wm. J. Parkes, City Engr.,
at the letting of contract for cement
, vitrified brick alley crossings and
s (bids for which were to have been
n Mar. 21) has been indefinitely
.

Birmingham, Ala.—See "Bridges."

**Little Rock, Ark.*—The Hill Crest Land Co. is stated to have awarded contracts for street improvements in Hill Crest as follows: Macadamizing and grading roads, F. B. Stewart, $10,938; constructing sidewalks and gutters, C. N. Feubel, $9,200.

Sacramento, Cal.—The Assembly is stated to have passed a bill providing for an appropriation of $10,000 to construct a State highway from Trinity County to Humboldt County, length of proposed road, 40 miles.

A bill is reported to have been passed by Senate providing for an appropriation of $20,000 for a highway from Kern County to Los Angeles County.

Edwardsville, Ill.—The City Council is stated to have passed a resolution authorizing the citizens to vote on issuing bonds not to exceed $30,000, for constructing sidewalks.

Moline, Ill.—Bids will be received Mar. 20 by the Bd. Local Improv., for grading, draining, curbing and paving with brick a portion of 17th St.; also for grading and paving with brick Market Sq. Henry G. Paddock, Secy.

Green Castle, Ind.—The Comrs. of Putnam County, according to reports, will receive bids for constructing gravel roads in Madison and Washington township, each road to be about one mile long.

Kokomo, Ind.—It is stated that the Comrs. of Howard and Cass Counties will receive bids for constructing 9 miles of gravel roads on the line between Howard and Cass Counties.

Bloomfield, Ind.—It is stated that bids will be received until Apr. 4 by the Co. Comrs. for constructing gravel and macadamized roads in Beech Creek Townships. Wm. H. Deckard, Co. Aud.

**Brazil, Ind.*—The County Comrs. are stated to have awarded to Noble Tarwin and Frank Weaver the contract for constructing 2 miles of gravel roads in Dick Johnson Township. for $5,435.

Michigan City, Ind.—It is reported that bids are wanted Apr. 3 for paving with brick several streets. Edw. H. Heise, Clk. Bd. Pub. Wks.

Creston, Ia—Bids will be received Mar. 21 by the City Council for curbing portions of several streets; bids will also be received on same date for paving with vitrified brick portions of several streets. W. H. Robb, City Clk.

Des Moines, Ia.—The Bd. of Pub. Wks. is stated to have been authorized to receive bids for paving with asphalt on W. Walnut St.

**Topeka, Kan.*—The County Comrs. are stated to have awarded the contract for macadamizing about 2 miles of the Burlingame Road to J. H. Maxwell, at $1.60 per cu. yd.

Ft. Mott, N. J.—Bids will be received by Capt. Louis F. Garrard, Jr., Q. M., U. S. A., Delaware City, Del., on Apr. 10, for granolithic sidewalks at Ft. Mott, as advertised in The Engineering Record.

Westfield, N. J.—Bids will be received Mar. 20 by the Town Council, at Broad and Elm Sts., for paving sidewalks with blue stone flag on portions of numerous streets. H. C. Van Emburgh, Consulting Engr., 149 North Ave., Plainfield. Lloyd Thompson, Town Clk.

Oswego, N. Y.—It is proposed to pave a portion of W. Bridge St. with brick, on a concrete foundation.

New York, N. Y.—Bids will be received Mar. 24 (readvertisement) by Maurice Featherson, Comr. of Docks, for furnishing material and repairing asphalt pavement along North and East Rivers.

**New York, N. Y.*—The contract for furnishing and delivering a steam road roller and a road scarifier for the Dept. of Parks, Boro. of Bronx (bids opened Mar. 9) has been awarded to the Buffalo Steam Roller Co., of Buffalo, N. Y., at $1,300, and $369, respectively.

**Cortland, N. Y.*—Engr. W. S. Farrington, 513 Dillaye Memorial Bldg., Syracuse, writes that contracts for paving (bids opened Jan. 26) have been awarded as follows: To the Barber Asphalt Paving Co., Philadelphia, Pa., for paving Owego and Tompkins Sts., 11,000 sq. yds. asphalt paving, $2.20 per sq. yd., and Maple Ave., 2,625 sq. yds. at $2.36 per sq. yd. The same company also secured contracts for other items in connection with this paving, as follows: 9,200 lin. ft. cement curb and gutter, 50 cts.; 505 lin. ft. stone headers, 45 cts.; 125 cu. yds. broken stone, $2, and 9,200 lin. ft. 3-in. closed drain tile, 4 cts.; total cost of the 3 streets, $36,255. The Barber Asphalt Co. also secured the contract for paving Clinton Ave., at the following detailed bid: 15,000 sq. yds. asphalt pavt., $1.93; 100 sq. yds. vit. brick pavt. in gutters, $2.23; 700 sq. yds. vit. brick pavt. in R. R. strip, $2.33; 8,950 lin. ft. cement curb and gutter, 39½ cts.; 375 lin. ft. stone headers, 60 cts.; 72 lin. ft. 30-in. c.-i. pipe, $5.14; 300 lin. ft. 30-in. vit. tile pipe, $3.43; 100 lin. ft. 8-in. vit. tile pipe, 42 cts.; 8,950 lin. ft. 3-in. closed drain tile, 2½ cts.; 150 cu. yds. broken stone, $2; 100 cu. yds. concrete (Portland) $4, and 4 catch basins, each $70.

*The Warnen-Quinlan Co., of Syracuse, secured the contract for paving Elm St. with sheet asphalt (bids opened Jan. 26) at the following detailed bid: 9,500 sq. yds. asphalt pavement, $1.84; 150 sq. yds. vit. brick pavt. in gutter, $2; 3,500 sq. yds. vit. brick pavt. in R. R. strip, $2.05; 6,850 lin. ft. cement curb and gutter, 62 cts.; 600 lin. ft. stone headers, 50 cts.; 180 lin. ft. 30-in. c.-i. pipe, $5.70; 1,000 30-in. vit. tile pipe, $3.15; 100 lin. ft. 8-in. vit. tile pipe, 40 cts.; 6,850 lin. ft. 3-in. closed drain tile, 3 cts.; 100 cu. yds. broken stone, $1.75; 500 cu. yds. concrete, $4, and 6 catch basins, $75; total, $36,548.

**Brooklyn, N. Y.*—The following are the bids opened on Mar. 8 by Martin W. Littleton, Pres. Brooklyn Boro., for regulating nad repaving with asphalt on a concrete foundation: (*a*) Brooklyn Alcatraz Asphalt Co., 12th St. and Gowanus Canal; (*b*) Interstate Paving Co., 44 Court St.; (*c*) Cranford Co., 52 9th St.; (*d*) Uvalde Asphalt Paving Co., 1 B'way, New York; (*e*) Eastern Bermudez Asphalt Paving Co., 26 Court St.; (*f*) Barber Asphalt Paving Co., 114 Liberty St., New York:

**Varet St., from Broadway to Bogart St.*

	a.	*b.*	*c.*	*d.*	*e.*	**f.*
10,870 sq. yd. asphalt pavement	$0.95	$1.00	$0.95	$0.92	$1.15	$0.88
1,830 cu. yd. concrete	4.60	3.90	4.20	5.20	5.50	3.87
5,670 lin. ft. new curb	.85	.83	.90	.85	1.00	.81
630 " old curb reset	.25	.35	.35	.35	.35	.30
33 covers for manholes	15.00	14.50	15.00	15.00	15.00	15.00
Total	$24,229	$23,430	$23,848	$25,069	$28,968	$21,941

**Lynch St., from Bedford Ave. to Broadway.*

	d.	*e.*	*c.*	*a.*	*b.*	**f.*
9,990 sq. yd. asphalt pavement	$0.88	$1.15	$0.95	$0.90	$1.00	$0.90
1,650 cu. yd. concrete	5.20	5.50	4.20	4.25	4.00	3.82
4,730 lin. ft. new curb	.85	1.00	.90	.85	.83	.81
520 " old curb reset	.35	.35	.35	.30	.35	.30
15 covers for manholes.	15.00	15.00	15.00	15.00	14.50	15.00
Total	$21,806	$25,707	$21,191	$20,410	$20,922	$19,513

**Bergen St., from 4th to Flatbush Ave., and from Carlton to Franklin Ave.*

	a.	*d.*	*c.*	**f.*
10,960 sq. yd. asphalt pavement	$1.20	$1.15	$1.25	$1.02½
40 " adjacent pavement	.25	.35	.35	.31
2,060 cu. yd. concrete	5.25	5.75	5.00	3.95
9,800 lin. ft. new curb.	.90	.85	.90	.81
1,090 " old curb reset	.30	.35	.35	.30
Total	$33,124	$33,174	$33,215	$27,648

**Halsey St., from Stuyvesant Ave. to Broadway.*

	a.	*d.*	*c.*	**f.*
9,110 sq. yd. asphalt pavement	$1.25	$1.15	$1.25	$0.99
1,690 cu. yd. concrete	6.00	5.50	5.00	4.16
7,760 lin ft.. new curb	.95	.85	.90	.84
860 " old curb reset	.30	.35	.35	.30
Total	$29,162	$26,675	$27,129	$22,832

**Ashland, Ky.*—Chas. D. Boggus, City Engr., writes that the following are the 5 lowest bids opened on Mar. 6 for paving; (*a*) John Bradley, of the Nashville Roofing & Paving Co., Nashville, Tenn. (awarded contract); (*b*) O'Kelly & Kelly, Ashland; (*c*) Moore, Parsons & Frey, Lafayette, Ind.; (*d*) Sam'l Dingle, Newcastle, Ind.; (*e*) Strucker Bros., Harrisburg, Pa.:

	**a.*	*b.*	*c.*	*d.*	*e.*
75,570 sq. yd. vitr. block.†	$1.47	$1.45	$1.48	$1.54	$1.55
34,300 lin. ft. concrete curb and gutter	.49	.55	.50	.48	.49
59 duplex inlets, each	15.00	14.00	12.00	18.00	18.00
18 5-ft. catch basins, 6½-ft. deep	10.00	35.00	30.00	27.00	40.00
80 lin. ft. 15-in. sewer pipe.	.50	.70	.60	.74	.68
1,200 " 12-in. " "	.45	.60	.50	.63	.50
400 " 10-in. " "	.40	. 50	.40	.48	.38

†On 6-in. concrete base, cement filler, including 54,300 cu. yd. excav., expansion joint of asphalt.

Boston, Mass.—Bids will be received Mar. 25 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for constructing vitrified brick pavement, curbing and sidewalks at navy yard here.

Flint, Mich.—D. E. Newcombe, City Clk., writes that all bids opened on Mar. 6 for furnishing a 10-ton road roller, have been rejected.

Menominee, Mich.—Bids are wanted April 10 for paving numerous streets with macadam and Ogden St. with brick, as advertised in The Engineering Record.

Escanaba, Mich.—Street Improvement bonds amounting to $50,000 are reported sold.

Erie, Pa.—The Select Council is stated to have passed the ordinance providing for the paving of W. 26th St.

Greenville, Miss.—Bids will be received until Apr. 4 by the City Council for constructing approximately 600,000 sq. ft. of granolithic sidewalk.

**St. Louis, Mo.*—The Bd. of Pub. Improvements is stated to have awarded contracts for paving portions of the following streets: Green Lea Pl., Virginia, Evans Belt, Bartmer Aves., with asphalt, to Parker, Washington Co., of Kansas City, for $82,485; Von Versen, Vandeventer, Nebraska, Marquette Aves. and N. Market St., with brick, alley block 2,061, alley block 3,356, to Fruin & Colnon, Laclede Bldg., for $85,406; Florissant Ave., with bituminous macadam, to Granite Bituminous Paving Co., 405 N. 6th St., for $24,662; Kennerly Ave. and N. Market St., with brick, to Henkel & Sullivan, for $16,481; alley block 4,917, 684 and 3,829 to Skrainka Constr. Co., 319 N. 4th St., for $8,564; alley block 3,542 and 3,647 to T. E. Cavanaugh, Alsace cor. Marcus Ave., for $4,540.

St. Louis, Mo.—The House of Representatives is stated to have passed a bill providing for the expenditure of $475,000 for good roads throughout the State.

Omaha, Neb.—Bids will be received Mar. 24 by the Bd. Pub. Wks., for grading including necessary approaches, portions of numerous streets. Wm. Coburn, Secy.

Atlantic City, N. J.—Bids will be received by the City Clk. on Mar. 27 for the curbing of Atlantic Ave., as advertised in The Engineering Record.

New Brighton, S. I., N. Y.—Bids will be received Mar. 28 by Geo. Cromwell, Pres. Boro. Richmond, for furnishing material and repaving with granite blocks on sand, portions of Richmond Terrace and Wright St., with sheet asphalt on concrete a portion of Union St., with vitrified brick on concrete a portion of Post Ave. and with wood blocks on concrete a portion of Canal St.; engineer's estimate, 13,860 sq. yds. granite blocks, 1,300 sq. ft. bridgestone, 11,600 lin. ft. curb., 1,700 sq. yds. asphalt, 4,100 sq. ft. flag. relaid, 6,640 sq. yds. vitrified brick, 3,500 sq. yds. wood blocks, etc.

**Brooklyn, N. Y.*—The following are the bids opened on Mar. 8 by Martin W. Littleton, Pres. Brooklyn Boro., for asphalt paving; (*a*) Lafayette Ave.; (*b*) Fountain Ave.: Eastern Bermudez Asphalt Paving Co., *a*, $19,188; Cranford Co., *a*, $18,753; *b*, $13,105 (awarded contract); Brooklyn Alcatraz Asphalt Co, *a*, $15,085; *b*, $14,586; Uvalde Asphalt Paving Co., New York, *a*, $16,330; *b*, $13,649; Barber Asphalt Paving Co., New York, *a*, $14,885 (awarded contract); *b*, $14,441; Interstate Paving Co., *b*, $13,223.

Bids will be received Mar. 29 by Martin W. Littleton, Boro. Pres., for regulating and repaving with asphalt block portions of 5 streets; with asphalt portions of 11 streets; with granite a portion of Grand Ave.; with granite block a portion of Kent Ave.; with asphalt and asphalt block portions of St. John's and Sterling Pl. and with Medina sandstone a portion of 35th St.; engineer's estimate, 65,890 sq. yds. asphalt block, 54,830 sq. yds. asphalt, 9,000 sq. yds. old stone pavement, to be relaid; 65,020 lin. ft. new curb., 10,780 sq. yds. granite block pavement, with tar and gravel joints; 21,380 cu. yds. concrete, etc.; also for furnishing material and constructing 13,070 sq. ft. concrete sidewalks on Fountain Ave.; for furnishing material and grading lots on several streets, requiring 15,643 cu. yds. earth excava.; also for furnishing and delivering 6,000 cu. yds. sand, 30,000 sq. ft. bluestone flag. and 7,000 lin. ft. bluestone curb.

Bids will be received Mar. 30 by the Bd. Park Comrs., for furnishing and delivering 3 steam road rollers and 2 road scarifiers. John J. Pallas, Pres.

**Geneva, N. Y.*—W. S. Wood, Secy. Bd. Pub. Wks., writes that the contract for paving E. North and Castle Sts. (bids opened Feb. 23) will be awarded to the McGreevy Constr. Co., of Ithaca, for $51,138.

Long Island City, L. I., N. Y.—Bids will be received Mar. 27 by Jos. Cassidy, Pres. Boro. Queens, for regulating, grading and repaving with asphalt on concrete foundation portions of Fulton St.; engineer's estimate, 24,600 sq. yds. asphalt, including binder course, 3,500 cu. yds. concrete, 6,000 lin. ft. new bluestone curb., furnished and set, etc.

Albany, N. Y.—Bids will be received Mar. 20 by the Bd. Contract and Supply, for furnishing material and improving a portion of S. Pearl St. by grading, curbing, paving carriageway with asphalt blocks, repairing sidewalks and constructing receiving basins. Isidore Wachsman, Clk.

Mayor Gaus is reported to have approved the ordinance authorizing the paving with granite block on a portion of Liberty St.

**Columbus, O.*—Contract for paving (bids opened on Feb. 24 by the Bd. of Public Service, Julian Griggs, Ch. Engr.) have been awarded as follows: To N. B. Abbott, of Columbus, paving Town and Kossuth Sts., and 16th Ave. with Athens block for $68,272; to L. D. E. Sullivan & Son, Columbus, for paving Worthington St., with 20th Century block for $4,956; to Frank J. Fisher, Columbus, paving Gilbert St., with Athens block, for $3,290, and Lazelle St., with Glouster block, $1,971, and to Shaw & Alger, Columbus, paving Schiller St. with Nelsonville block for $6,549.

**Toledo, O.*—Russell & Jennison are stated to have received the contract for paving with wood block on a portion of Winthrop St. for $6,835.

The contract for paving with Canton brick on a portion of Idaho St. is stated to have been awarded to John C. Carland for $9,697.

The following are the bids received Feb. 28, by the Bd. of Pub. Service, for paving a portion of Jefferson Ave.: Russell & Jennison. with brick, $13,478; Barber Asphalt Paving Co., with sheet asphalt, $19,597; H. P. Streicher, with bitulithic, $21,343; C. H. Burchinal, with asphalt block, $19,678; Wm. J. McMahon, with Medina stone, $49,233, and Russell & Jennison, with wood block, 4 in., $24,167, and 3 in., $21,057.

**Philadelphia, Pa.*—The Barber Asphalt Paving Co., Land Title Bldg., is stated to have received the contract (bids opened Feb. 17) for paving with asphalt about 20 miles of streets and repaving with asphalt about 4 miles of streets, at $1.55 per sq. yd. for the former and $1.50 per sq. yd. for the latter.

Items marked thus give the names of parties awarded contracts.

Wilkesbarre, Pa.—It is stated that bids will be received until Mar. 20 (readvertisement), by Fred. H. Gates, City Clk., for furnishing and delivering vitrified, grooved and lugged paving block on about 7 miles of streets. W. V. Ingham, City Clk.

It is stated that bids will be received until Apr. 3 by the State Highway Dept., at Harroad in Luzerne County.

Seattle, Wash.—The City Council has passed ordinances ordering the following paving work for the year 1905: Asphalt paving, on Prospect St., to cost $21,800; 18th Ave., $416,000; 6th Ave. W., $18,800; Cedar St., $20,880; Olympic Pl., $13,800; 35th Ave., $27,750. Asphalt and brick paving, on Pike St., $60,850; sandstone block, on Warren Ave., $4.900. Grading and concrete walks on Main St., $74,500; Franklin Ave., $35,000. Concrete walks, on Wallingford Ave., $53,900.

Bids will be received Mar. 25 by C. B. Bagley, Secy. Bd. Pub. Wks., for paving with asphalt 35th Ave.; estimated cost, $21,750; Olympic Pl., estimated cost, $13,800, and 6th Ave., W., estimated cost $26,600; also for paving with sandstone block Warren Ave., estimated cost $4,900, and constructing concrete walks on 10th Ave., N., estimated cost, $10,500.

**Winnipeg, Man.*—C. J. Brown, City Clk., writes that the contract for supplying 1,000 to 1,500 tons of asphalt for paving (bids opened Feb. 21) has been awarded to U. S. & Venezuela Co., 1 Broadway, New York, N. Y., at $26.15 per ton.

POWER PLANTS, GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

See also under "Civil Sundry Appropriations."

West End, Ala.—The City Council is reported to have granted the Birmingham Ry., Light & Power Co., of Birmingham, a franchise to lay gas mains and construct an electric light system in West End.

Harrisburg, Ark.—A. A. Boone, of Greenfield, writes that bids will be received until about Apr. 15 for the construction of an electric light plant for Harrisburg; probable cost, $4,000.

San Bernardino, Cal—The Home Gas & Lighting Co., is reported incorporated, with a capital of $19,800. Seth Hartley is the chief promoter.

Empire, Colo.—W. P. Clough, of Denver, Pres. Clear Creek County Power & Irrig. Co., writes that it is proposed to construct a power plant, at a cost of about $75,000. Contracts will probably be let about May 1. Engineer, H. R. Oliver, Georgetown, Colo.

Covington, Ga.—It is reported that the City Council is arranging to re-establish the city electric light plant.

Washington, D. C.—Bids will be received Mar. 28 at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing at navy yards, Portsmouth, N. H.; Boston, Mass.; New York, N. Y.; League Island, Pa.; Annapolis, Md.; Washington, D. C.; Norfolk, Va., and Pensacola, Fla., a quantity of sand, gravel, bar iron and steel, sheet-copper, c.-i. pipe and fittings, submarine cable, crucible steel wire, Westinghouse electrical supplies, steel rivets, steel plates and bars, steam gauges, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Polo, Ill.—Milton Snyder, of the Polo Electric Light & Power Co., writes that it is proposed to construct a gas plant, to cost $12,000. Engineer, U. R. Freisenberg.

Bloomington, Ill.—The City Council has granted C. A. Griffin, S. R. White and P. R. Longworth a franchise to manufacture and distribute steam and electricity for heating, lighting and power.

Lockport, Ill.—The Lockport Gas Co., of Lockport, is reported incorporated, with a capital of $50,000, to manufacture light, power and appliances. Incorporators: John F. Sloan, John D. Meenan and Jas. H. Sloan.

*Local press reports state that the Trus. of the Sanitary Dist. at Chicago, on Mar. 8, awarded to the Crocker-Wheeler Co., of Chicago, the contract for furnishing and installing four 4,000-kw. generators and two 350-kw. exciters for the Lockport power development (bids opened Feb. 15), for $101,366.

Danville, Ill.—Press reports state that the Danville St. Ry. & Light Co. (W. B. McKinley, Pres., Champaign) is preparing to expend $50,000 in improving its lighting system at Danville. Mr. McKinley is also reported to have in contemplation improvement of his plant at Decatur, including the installation of new boilers and the laying of new gas mains.

Laporte, Ind.—The Laporte Gas & Coke Co. is reported to have been reorganized as the Laporte Gas Light Co. It is proposed to erect a new holder of 100,000 ft. capacity and add some new gas machinery.

Lafayette, Ind.—Isham Randolph, Engr. Sanitary Dist. of Chicago, Ill., in his report to the business men of Lafayette interested in the feasibility of building a dam across Wabash River for the generation of power, estimates the total cost of the dam, hydraulic and electrical equipment, at $248,000.

Oolitic, Ind.—The Town Bd. is reported to have decided to construct combined water works and electric light plant at a probable cost of $23,000. Engineer, Geo. C. Morgan, Chicago, Ill.

South McAlester, Ind. Ter.—The Choctaw Electric Co., of South McAlester, is reported incorporated, with a capital of $150,000, by A. E. Pierce, C. G. Wehrley and M. M. Lindley, to take over the property of the South McAlester Electric Light & Power Co.

Jewell City, Kan.—A. G. Blankenshy writes that bids will be received May 15 for constructing an electric light plant, to cost $2,000.

Ft. Leavenworth, Kan.—Bids are wanted Mar. 23 for furnishing and installing electric fixtures and wiring; also furnishing, delivering and installing wattmeters in certain buildings at this post. Maj. D. E. McCarthy, Q. M.

Junction City, Kan.—Press reports state that the Republican River Hydraulic Power Co. is preparing to construct a dam here for electrical purposes.

Carlisle, Ky.—It is reported that the plant of the Citizens' Electric Light Co., recently burned, will be rebuilt.

Baltimore, Md.—A trust mortgage of $7,500,000 from the Baltimore Electric Power Co. to the Northern Trust Co., of Philadelphia, Pa., has been recorded. $3,000,000 of this is for future extensions and improvements, including increased electric power.

The following are the bids opened on Mar. 8 by the Bd. of Awards, for the street electric arc light contract. The Consolidated Gas, Electric Light & Power Co. bid $67.49 for the entire service. The Maryland Telephone & Telegraph Co. bid $76.47 per lamp for 1 yr.; $70.47 for 3 yrs.; $69.47 for 5 yrs., and $69.47 for 10 yrs. The bids call for 198 lamps in the subway district and 1,577 lamps outside the subway district, including 200 in the parks, the length of the contract to be 1, 3, 5 or 10 yrs.

Centerville, Md.—D. S. Pindell, of Sault Ste. Marie, is reported to have secured a franchise for the construction of an electric light and gas plant at Centerville.

**Duluth, Minn.*—C. A. Duncan, Pres. Great Northern Power Co., writes that the National Ry. Constr. Co. (general contractors) have awarded to Porter Bros., of Duluth, the contract for constructing a canal (bids opened Feb. 21).

Stillwater, Minn.—The Stillwater Electric Light & Gas Co. is reported to have secured a 10-yr. franchise; one of the provisions of the grant is that the company construct a new gas plant for coal gas by Sept. 1, and also provide a new system of incandescent lights for the streets.

New Albany, Miss.—Bids are wanted Mar. 28 for the construction of water works and an electric light plant, as advertised in The Engineering Record.

Columbus, Miss.—It is reported that the Columbus Light & Power Co. contemplate improving its gas plant.

St. Louis, Mo.—A. P. McBride, of Independence, Kan., is reported to be connected with the Consolidated Oil, Gas & Mfg. Co., of Independence, and the Indian Territory Illuminating Co., of the Osage reservation, which proposes building a pipe line to St. Louis, to furnish the city with natural gas.

Moberly, Mo.—The Moberly Gas & Electric Co. (J. Green, Pres.) proposes reorganizing and rebuilding its plant this spring.

Tekamah, Neb.—J. M. Crowell, City Clk., writes that it was voted Mar. 7 to issue $10,000 bonds for the purchase or installation of an electric light plant.

**West Point, N. Y.*—Maj. J. M. Carson, Jr., Q. M., U. S. A., writes that the contract for installing a boiler and mechanical draft plant at West Point, has been awarded to the Babcock & Wilcox Co., 85 Liberty St., N. Y. City, for $37,447.

New York, N. Y.—Bids will be received Mar. 27 by C. B. J. Snyder, Supt. School Bldgs., for installing electric equipment in School No. 64, Boro. Manhattan.

Dallas, N. C.—Dr. S. A. Wilkins, Clk, of Town Bd., writes it is proposed to construct an electric light plant, at a cost of $3,000.

Arcanum, O.—The citizens are reported to have voted Mar. 6 to issue $38,000 bonds for water works and an electric light plant.

Baker City, Ore.—The Baker City gas and electric light plant is reported to have been sold to an eastern syndicate. It is reported that about $400,000 will be expended in improvements in enlarging the capacity of the power plant and in constructing a suburban railway, taking in Haines and the lower Powder River Valley. Isaac W. Anderson, of Spokane, is reported interested.

Newberry, S. C.—Press reports state that Horace B. Parker, of Boston, Mass., will finance the enterprise which proposes developing water power at Parr Shoals, on Broad River, near Peak Station, bet. Newberry and Columbia.

Darlington, S. C.—Press reports state that the new owners of the Darlington Light & Water Co. propose enlarging the plant. It is also proposed installing a plant at Timmonsville.

Collierville, Tenn.—The citizens are reported to have voted on Mar. 3 to issue bonds for the construction of an electric light plant.

Bristol, Tenn.—The Council has passed on first reading the ordinance granting J. Edw. Durham, of Philadelphia, Pa., and Wm. B. Cutter, of Buffalo, N. Y., a franchise for an electric light plant.

Hamilton, Tex.—The Hamilton Light & Ice Co. is reported incorporated, with a capital of $20,000 for the manufacture and sale of ice and electric light and power. Incorporators: W. A. McSpadden, of Cisco, and J. A. Muhl, of Waco.

Lynchburg, Va.—The City Clk. writes that a committee is looking into the matter of constructing a municipal electric light plant.

Rockford, Wash.—W. F. Connor, of the Washington Water Power Co., of Spokane, is reported interested in the construction of an electric light plant at Rockford.

Northfork, W. Va.—The Elkhorn Light & Power Co., of Northfork, is reported incorporated, with a capital of $100,000, to own and operate power plants and machinery for generating electricity and to use same to transmit heat, light and power; also to construct telephone and telegraph lines. Incorporators: J. J. Tierney, Elkhorn; L. H. Clark, of Kyle, and others.

Tomah, Wis.—The Tomah Gas Co. is reported incorporated; capital, $40,000. Incorporators: Winfred W. Warren, Harry H. Sherwood and Wm. R. McCaul.

Westmount, Que.—The Council is reported to have under consideration the construction of municipal water works and an electric light plant.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Los Angeles, Cal.—The Pacific Electric Ry. Co. proposes extending its Lamanda Park branch to Sierra Madre, a distance of 4 miles.

Washington, D. C.—The House of Representatives and U. S. Senate are stated to have passed the bill granting the Anacostia, Surrattsville & Brandywine Electric Ry. Co. the right to extend its lines into Anacostia.

Boise, Idaho.—It is stated that 3 routes have been surveyed for the extension of the lines of the Boise Traction Co. to Pearl. The line will probably be built this spring.

Chicago, Ill.—Residents of the North Shore are reported to be in favor of granting the Chicago, Milwaukee & St. Paul Ry. Co. the right to equip its Evanston branch with electricity.

Edwardsville, Ill.—An ordinance granting a franchise to the Edwardsville, Alton & St. Louis Ry. Co. to construct a line to Mitchell, a distance of 8 miles, has been passed by City Council. Fred. E. Allen, of St. Louis, Pres.

Chicago, Ill.—It is reported that plans are being prepared by the Chicago City Ry. Co., for the construction of a power house near the south branch of the river and north of 22d St.

Rockfield, Ind.—C. F. Knowlton, representing the Indianapolis & Chicago Air Line Traction Co., is reported to be arranging for a survey of the proposed line between Rockfield and Flora.

Frankfort, Ind.—A petition is reported to have been filed here by the taxpayers, asking for a subsidy election to vote $100,000 in aid of the proposed Tipton, Frankfort & Attica Traction line. The petition provides that the power house and car shops shall be located in Frankfort.

Lafayette, Ind.—Townsend-Reed & Co., who constructed the Indianapolis & Northwestern Traction Company's road, is stated to have in contemplation the construction of an interurban line between Lafayette and Chicago.

Bedford, Ind.—Surveys are stated to have been completed for the Bedford St. Ry. and the extension to Ooleetee City.

Louisville, Ky.—The present owners of the Henderson City Ry. are reported to have secured franchises and rights of way for an electric railway from Evansville, Ind., to Henderson and Owensboro, Ky.

New Orleans, La.—The franchise for an electric street railway, to be operated in Jefferson Parish from the Orleans Parish line to the Texas & Pacific Railroad depot in Gretna, is reported to have been secured by Leigh Carroll and Jas. Dinkins, prominently identified in the business affairs of Algiers and Gretna sections.

Worcester, Mass.—The directors of the Worcester Consolidated St. Ry. Co., is stated to have voted to relay the Vernon and Providence St. lines with heavy girder rails.

The Boston & Worcester St. Ry. Co. will complete about 5 miles of double track between Southboro and Framingham. The directors have also decided to round out the road's system in Natick by building 1¼ miles of road into this town, at an estimated cost of $15,000.

Sutton, Mass.—The Selectmen are stated to have granted a franchise to the Worcester & Providence St. Ry. Co., of Worcester. Work will be commenced in the spring.

Benton Harbor, Mich.—It is stated that the St. Joseph River Traction Company's line, which was originally intended to connect Benton Harbor, Niles and Dowagiac, will be extended north from this city to Kalamazoo, with a spur to Sister Lakes.

**Detroit, Mich.*—The United Ry. is extending the capacity of its Atwater St. station and has ordered a 32x68-in. Reynolds-Corliss engine from the Allis-Chalmers Co.

New York, N. Y.—Mayor McClellan has approved the resolution of the Bd. of Aldermen granting a franchise to the New York & Jersey R. R. Co. to construct and operate a subway railroad up 6th Ave. to 33d St. in connection with its tunnel under North River.

Elmira, N. Y.—The Chemung Valley Traction Co. has been incorporated, with a capital of $700,000, to operate a street railroad 18½ miles long from Elmira to Waverly. Directors: E. E. Buchanan, Boyd McDowell, of Elmira; J. E. Ford, of Waverly, and others.

Auburn, N. Y.—It is reported that the State Bd. of Railroad Comrs. has granted the Auburn & Northern Electric R. R. permission to construct a 9-mile double-track road from Auburn to Port Byron.

Greensboro, N. C.—The stockholders Alamance St. Ry. Co. have elected Menefee, of Graham, Pres. The com be ready to begin work on its prop this spring.

Fostoria, O.—The Toledo, Fostoria & lay Ry. Co. is stated to have procured of way for its extension from Fos Pemberville, about 20 miles in length.

Lebanon, O.—The Miami Transit Power Co., which proposes to buil from Lebanon to Xenia, is stated creased its capital from $100,000 to

Cincinnati, O.—It is reported that River & Columbus Ry. Co. is planning tend its line from Ripley to Aberdeen veys are also being made for the of the line from Sardinia to Hillsbor

Zanesville, O.—The Southeastern Light & Power Co. is stated to have a franchise in Zanesville.

The Zanesville, Cambridge & Northern tion Co. (W. A. Ginn, Columbus, Chf. will construct a line from Zanesville Philadelphia, with a spur to Cambrid

Cleveland, O.—The citizens of and Henrietta townships are stated petitioned the Cleveland & South Traction Co. to build a line throug townships, connecting the North branch with the Norwalk branch.

The Cleveland Electric Ry. Co. is sta be preparing to install a large storag tery station on Harvard St.

The Roberts & Abbott Co., of Clevela reported to be the consulting engineer the work of extending the Detroit, F Saginaw Ry. from Passar to Flint and Saginaw to Tronkmouth, about 50 Active work will start at once. Timothy ney and T. G. Sullivan, of Detroit, are head of the company. The power sta Bridgeport, which is partially complete be enlarged. Risinger & Prather, of burg, Pa., are engineers for the power

Milford, O.—It is stated that the nati & Columbus Traction Co. (B. W. F Ch. Engr., Cincinnati) has been gran franchise to construct a line through M

Columbus, O.—The Columbus Ry. & Co. is stated to be preparing to inst storage battery station.

**Toledo, O.*—The Toledo Interurban Co. has recently awarded to the Allis mers Co. the contract for the complete ment of the new power house of the T Port Clinton & Lake Side Ry. at Port O., including two 1280-h.p. Reynolds engines, two 800-kw. Bullock A. C. ge tors, two 50-kw. Bullock D. C. generators 400-kw. Bullock A. C. rotary converter Tomlinson barometric condensers, and pumps, heaters, etc. Bullock railway have been in successful operation on road for some time past. Arrangements been made to have the new extension railway completed as far as Marblehe July 1.

**Mansfield, O.*—The Mansfield Ry., Power Co. has ordered for the revampi its power station a 250-kw. and two generators, a 500-kw. and a 600-kw. generator, a 125-h.p. motor and a moto rator set. The Allis-Chalmers Co. re the order, which will be filed at their B works in Cincinnati.

Barberton, O.—The Barberton, Wads & Western Traction Co. is stated to ha cided to construct the car house and station at Barberton. Work between B ton and Wadsworth will start in the future. J. Edw. Collins, of Barberton, Engr.

Martin's Ferry, O.—The Wheeling Tr Co. is stated to have petitioned for a chise to extend its line through Ma Ferry. It is planning to build to Bri this year, which will give it connection Steubenville.

Baker City, Ore.—See "Power Plants and Electricity."

West Chester, Pa.—It is stated tha West Chester St. Ry. Co. has had su made with a view to constructing an exte from the Downingtown line, through shallton, Embreeville, Mortonville, M and Coatesville during the coming year.

Irwin, Pa.—See "Bridges."

Ogden, Utah.—An application for a chise of the electric railway in Cache V to be constructed by the Amalgamated Co., has been presented to the Co. Cour

Spokane, Wash.—The Spokane Ter Co., with a capital of $300,000, is sta have been organized by the Cœur d Ale Spokane, the Spokane & Inland and Spokane Traction Co., to construct and terminals worth about $600,000.

Wellsburg, W. Va.—The Tri-State Ry is reported to have taken over the fran owned by S. George, in Wellsburg, and build a line from this place to Follansbe

Vancouver, B. C.—It is reported that have been signed by the Canadian Pacific and the British Columbia Electric Ry the transfer of the Vancouver & Lulu Ry. to the British Columbia Electric Work will be commenced at once to co the road from steam to electricity.

It is reported that the Chilliwack Ele Tramway Co. is asking the British Colu Legislature for a grant or subsidy for proposed line from Chilliwack to New minster, and has secured the endorseme the Vancouver City Council and the mu palities of Sumas, Matsui, Langley and wack. J. Burt Morgan is the chief pro of the company.

**Items marked thus give the names of parties awarded contracts.*

Ont.—It is reported that the acific R. R. Co. will build an way from Hamilton to Niagara

oung & Maw, of Hamilton, solici- Hamilton, Galt & Berlin Ry. Co., notice that they will apply to the of Canada for power to construct and extensions to Guelph and it.

Ont.—The Ottawa River Electric y's plans for the line between and Montreal, are stated to have ed by the government.

ines, Ont.—The Canada-Middlesex Co. is applying to the Dominion for a charter to build a railway St. Catherines, Brantford, Wood- London.

RAILROADS.

ranged Alphabetically by States.

ck, Ark.—The Missouri, Arkansas R. R. Co. is reported incorporated, ital of $2,000,000. The proposed pass through Greene, Lawrence, Independence Counties, running to Directors: Robt. W. Earnhart, , Lyman F. Reeder and others.

Ill.—The Chicago, Joliet & Kan- y. Co. is reported incorporated, to lroad from Chicago to Keithsburg, y of Joliet, with branches. Capi- 000. Principal offices to be in Chi- orporators: Millard S. Denslow, J. Walton, Chas. W. Stevens and of Chicago.

olis, Ind.—A resolution has been the Bd. of Pub. Wks., authorizing ngr. to investigate the grade cross- e city for the purpose of recom- here the elevation should begin.

Ga.—The Atlantic & Birmingham . is reported formed, with a capital 000, by R. E. Cullinane, W. B. . M. Sisk and S. J. Bradley. Prin- to be at Atlanta. The main busi- e company will be the construction tern end of the Atlantic & Birming- into the Alabama coal and iron

ar. 26 large and small amounts of ork will be let by the Atlantic & m R. R. (Alex. Bonnyman, Ch. unswick).

N. M.—The St. Louis, Rocky Moun- cific R. R. Co. is reported incorpor- a capital of $2,250,000, to construct m Raton along Cimarron River, to and along Cimarron canyon to own, a distance of 75 miles. Incor- Hugo Koehler and Max Koehler, of , Mo., and Jere. Leahy and Chris. vell, Raton.

York, N. Y.—The contract for con- twin tunnels under Bergen Hill was by the Pennsylvania R. R. Co. on to the John Shields Constr. Co., 1 Ave., New York. It is stated that d stipulates that the work shall be l in less than 2 years. Contract orted to be about $2,250,000.

lphia, Pa.—Press reports state that ons to have every grade crossing in abolished were opened on Mar. 13, Mayor Weaver and the officers of sylvania R. R. (W. H. Brown, Ch. iladelphia), the Philadelphia & Read- Co. (Wm. Hunter, Ch. Engr., Phila- and the Baltimore & Ohio R. R. arothers, Ch. Engr., Baltimore, Md.). r the proposed elevation of tracks n drafted under direction of Chief of the Bureau of Surveys, and the ing departments of the railroads are ng them.

erlain, S. D.—Press reports state Chicago, Milwaukee & St. Paul R. R. J. Whittemore, Ch. Engr., Chicago, incorporated the White River Valley c R. R. Co. to construct an extension amberlain across the Missouri and Dakota, Wyoming, Oregon and Wash- o Seattle.

cood, S. D.—The White River Valley has been incorporated by O. L. Bran- C. Bette and others, to construct a m Deadwood to the east bank of the i River, a distance of 250 miles, pass- ough Lawrence, Meade, Pennington, . Lyman and Brule Counties. Esti- cost to complete the railroad is $7,-

ne, Wash.—D. C. Corbin, of Spokane, who has financed and built several estern railroads, is reported to have ced that the entire bond issue of $4,- for building the Spokane International a connection with the Canadian Paci- he boundary, has been subscribed, and he construction work will begin at

esburg, W. Va.—The West Virginia, rg & Atlantic R. R. Co. is reported in- ted, to construct a railroad from burg to Durbin. Incorporators: C. W. and C. E. Mower, Hendricks, W. Va.; Baker, Beverly, W. Va.; A. J. Arm- Parsons, W. Va., and R. F. Whitmer, lphia, Pa. Length of line will be about es.

PUBLIC BUILDINGS.

s Arranged Alphabetically by States.

also under "Civil Sundry Appropria-

nix, Ariz.—The plans of W. R. Norton, enix, have been accepted for a $25,000 ie Library.

California.—Bills have been passed by the State Legislature, as follows: Senate—Appropriating $150,000 for a sanatorium for the treatment of curable cases of tuberculosis; $35,000 for a dormitory at the Home for Adult Blind in Alameda County; $20,000 for a hospital for the care of insane persons suffering from tuberculosis. Assembly—Appropriating $65,000 for a new wing at the Southern California State Hospital; $25,000 for the erection of a State historical building at Los Angeles in which shall also be provided rooms for the use of the Supreme Court and for the accommodation of the National Guard; $25,000 for the erection of additional buildings, and $55,000 for the completion of the main building at the Home for Feeble-minded Children; $25,000 for the erection of a work shop on the grounds of the Industrial Home of Mechanical Trades for the Adult Blind in Alameda County; $352,000 for repairing and remodeling the State Capitol. A bill has passed both the Senate and Assembly for the construction of separate cells, and the erection of surrounding walls and outer works at Folsom and San Quentin prisons, appropriating $195,000 and $310,000, respectively.

New Haven, Conn.—It is stated that bids are wanted Apr. 4 for erecting a 2-story police station. Brown & Von Beren, Archts., Exchange Bldg.

Washington, D. C.—The following are the bids opened on Mar. 3 by the Bureau of Yards & Docks, Navy Dept., for constructing a steel and concrete floor in Bldg. No. 118, at the Navy Yard, Washington: Lyons Bros., Washington, D. C., $5,447; J. Pavavini, Washington, D. C., $8,000; R. J. Beale, Washington, D. C., $5,430; F. Drew, Washington, D. C., $5,687; J. P. Smith, Washington, D. C., $6,690; North Eastern Constr. Co., New York, N. Y., $6,423; Snare & Triest Co., New York, N. Y., $5,388; Lauer & Harper Co., Baltimore, Md., $5,455; F. J. Boas, Philadelphia, Pa., $5,385; American Paving & Constr. Co., Philadelphia, Pa., $7,955, and Penn Bridge Co., Beaver Falls, Pa., $5,448.

Washington, D. C.—Bids will be received by Capt. John Stephen Sewell, Corps Engr., U. S. A., on Mar. 29, for wooden window frames, glazed sash and interior window trim for building for Army War College, as advertised in The Engineering Record.

**Colquitt, Ga.*—J. H. McKenzie & Son, of Augusta, it is stated, have received the contract to erect the court house, at about $28,480.

Savannah, Ga.—The following are the 3 lowest bids opened on Mar. 9 by the Superv. Archt., Treas. Dept., Washington, D. C., for a ventilating and heating apparatus for U. S. Marine Hospital at Savannah: Crawford & Ragland, Winston, N. C., $4,120; E. J. Esbelding, Augusta, $4,997, and Liddell M. & S. Co., Montgomery, Ala., $4,499.

Chicago, Ill.—Bids will be received Apr. 1, by the Dept. Pub. Wks., for constructing caisson foundations for a 10-story fireproof commercial building to be erected on Madison Ave. F. W. Blocki, Comr.

Hammond, Ind.—The following are the bids opened on Mar. 13 by the Superv. Archt. Treas. Dept., Washington, D. C., for the construction of the U. S. Post Office at Hammond: McCarthy Bros., Chicago, Ill., $136,000; C. W. Gindele Co., Chicago, Ill., $116,670; Winchester & Cullen, Janesville, Wis., $113,848; W. H. Cook, Rockford, Ill., $117,737; W. J. McAlpine, Dixon, Ill., $116,300; W. F. Stillwell, Lafayette, $135,955.

Indianapolis, Ind.—It is reported that the Bd. of Trade is considering the erection of a $165,000 building on the present site.

Waterloo, Ia.—Bids will be received Mar. 20, by J. G. Ralston, Archt. and Library Comr., for erecting 2 libraries, bids to be submitted separately on each, and also on heating, plumbing and electric wiring.

Vinton, Ia.—F. G. Bryner, Clk. District Court, writes that the Benton Co. Comrs. will at their session in April, discuss the matter of receiving bids for the proposed court house; probable cost of structure is $90,000.

**Des Moines, Ia.*—The following contracts, it is stated, have been awarded for work in connection with the erection of the court house: Ornamental iron work, to the Twin City Iron & Wire Wks., St. Paul Minn., at about $24,980; plastering, to W. S. Fraley, of Des Moines, at about $41,127; carpenter work, to Chas. Weitz & Sons, 713 Mulberry St., at $34,117; and electric wiring, to the Bergren Electric Co., of St. Paul, Minn., at $16,095. The contracts for the scagliola, marble, tile and cement floors and elevators have not as yet been awarded.

Oakland, Md.—It is stated that bids are wanted Apr. 12 by A. G. Ross, Clk., for erecting a 2-story brick and stone jail and sheriff's residence. Holmboe & Lafferty, Archts., Clarksburg, W. Va.

**Baltimore, Md.*—A building permit has been granted for the Franklin Sq. Hospital which is to be erected at Fayette and Calhoun Sts., cost, $24,000. G. W. Davidson, Builder, 1819 Maryland Ave.; also for a 2-story Fire Dept. building to be erected on Oliver St., cost, $26,100. Fred. Decker & Son, Builders, 1209 E. Biddle St.

Marlboro, Mass.—Allen, Collins & Berry, of Boston, will probably have plans ready by Apr. 1 for an armory which will cost $25,000. The building will be of brick and wood.

Muskegon, Mich.—The following are the bids opened on Mar. 8 by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction complete of U. S. Post Office at Muskegon: C. W. Gindele Co., Chicago, Ill., $48,500; Chas. Hoertz & Son, Grand Rapids, $51,200; W. G. Turner Co., Chicago, Ill., $56,700; A. Watchorn, Chicago, Ill., $64,100; Northern Constr. Co., Milwaukee, Wis., $51,785; F. J. Cullen, Chicago, Ill., $56,700; Ed. Henry, Tipton, Ind., $57,880; McCarthy Bros., Chicago, Ill., $52,238; Geo. Richman's Sons Co., Kalamazoo, $57,500; I. J. Olson & Son, Muskegon, $52,201.

Ann Arbor, Mich.—A Carnegie Library is to be erected on Huron St., to cost $30,000.

**Elbow Lake, Minn.*—J. S. Arneson, Co. Aud., writes that the contract for furnishing material and erecting a 2-story and basement brick and stone court house (bids opened Mar. 9) has been awarded to Prince Constr. Co., of Minneapolis, for $60,202.

**Minneapolis, Minn.*—John Parten, of St. Paul, it is stated, has received the contract to erect the Minneapolis Armory at $113,000, and Allan Black, of St. Paul, the contract for the plumbing of same.

New Augusta, Miss.—The Bd. of Superv., it is reported, has passed an order authorizing the issue of $65,000 bonds for court house and bridge purposes.

**Sardis, Miss.*—The Bd. of Superv., it is reported, has awarded the contract to erect the court house for Panola County to M. T. Lewman & Co., of Atlanta, Ga., at about $33,000.

**Greenwood, Miss.*—C. W. Crockett, Chancery Clk., writes that contracts for erecting the county court house have been awarded as follows: Construction, R. Jesty & Co., Winona, Miss., $74,932; heating, Sodeman Htg. & Power Co., St. Louis, Mo., $2,818, and plumbing, T. J. Phillips, Greenwood, $2,247.

New Albany, Miss.—Bids are wanted Apr. 10, for $10,000 county jail bonds. John W. Pannell, Co. Treas.

*Dobson & Bynum, of Montgomery, Ala., it is stated, have received the contract to erect the new jail, at $11,994.

St. Joseph, Mo.—It is stated that bids are wanted Apr. 18 for erecting an auditorium. Eckel & Mann, Archts., Commercial Bldg.

St. Louis, Mo.—It is reported that the Employes' Hospital Assoc. of the Frisco Line has purchased a site at Laclede and Euclid Aves. on which it is proposed erecting a hospital.

Jefferson City, Mo.—The Senate has passed a bill appropriating $199,000 to erect a new supreme court building.

Lincoln, Neb.—Bids will be received Apr. 3 by the Bd. Pub. Lands and Bldgs., for furnishing and delivering f. o. b. cars 2 boilers and necessary fittings for Nebraska Hospital for Insane, here. A. Galusha, Secy.

Exeter, N. H.—The managers of the Exeter Cottage Hospital, it is reported, have accepted plans for a new hospital. $27,000 available for the work.

Concord, N. H.—The Legislature has appropriated $100,000 for the year 1905 and the same amount for 1906 to be used by the State Hospital in enlarging old and erecting new buildings. Dr. Chas. P. Bancroft, Supt.

Dover, N. H.—Mayor J. H. Neally, of Dover, Chmn. Bd. Trus. for general hospital for city, is looking for a site for the proposed building.

Trenton, N. J.—A bill has passed the Senate appropriating $250,000 for the construction and equipment of additional buildings at the State Hospital for the Insane, at Trenton.

New York, N. Y.—Bids will be received by the Superv. Archt., Treas. Dept., Washington, D. C., on May 8, for the interior finish of the U. S. Custom House at New York; also on May 9 (not May 18 as previously stated) for the mechanical equipment of said building, both advertised in The Engineering Record.

Bids will be received Mar. 29 by the Bd. of Health, for furnishing material and erecting a dormitory on 3d floor of laundry building at Riverside Hospital, North Brother Island, Boro. Bronx. Thos. Darlington, M. D., Pres.

Brooklyn, N. Y.—The following are the bids opened on Mar. 11 by the Bureau of Yards & Docks, Navy Dept., Washington, D. C., for constructing a concrete and steel prison, Bldg. No. 215, at the New York Navy Yard: (*a*) price for the prison with 5 stories of cells complete; (*b*) building complete with only 4 stories of cells; (*c*) building complete with only 3 stories of cells; also other bids with certain deductions and modifications: Northeastern Constr. Co., 949 B'way., New York, N. Y., *a*, $54,214; *b*, $47,678; *c*, $45,190. F. W. Carlin Constr. Co., 26 Court St., Brooklyn, *a*, $58,915; *b*, $52,377; *c*, $46,495. Broderick & Wind Eng'g & Constr. Co., 1 Madison Ave., New York, *a*, $64,900; *b*, $61,700; *c*, $58,500. The Wilson & Baillie Mfg. Co., 26 Court St., Brooklyn, *a*, $104,000; *b*, $98,100; *c*, $92,100. Wm. Horne Co., 245 West 26th St., New York, *a*. $69,670; *b*, $64,241; *c*, $59,100. Geo. B. Spearin, 17 Battery Pl., New York, *a*, $64,539; *b*, $59,479; *c*, $53,869. Conners Bros. Constr. Co., 16 Thorndike St., Lowell, Mass., *a*, $52,800; *b*, $3,100 (deduct.); *c*, $6,000 (deduct.). Richd. C. Heningham, 4-5 Court Sq., Brooklyn, N. Y., *a*, $57,000; *b*, $52,000; *c*, $47,000. Smith & Robinson, 17 State St., New York, *a*, $57,840; *b*, $53,730; *c*, $49,580. Geo. Vassar Son & Co., 111 Fifth Ave., New York, *a*, $57,000; *b*, $53,028; *c*, $49,246. Chas. Meads & Co., 220 B'way, New York, *a*, $50,730; *b*, $46,840; *c*, $43,900. O'Brien & Hoolihan Contr. Co., 1722 Park St., Syracuse, *a*, $64,399; *b*, $60,245; *c*, $56,099. Buckley Realty Constr. Co., Times Bldg., New York, *a*, $62,000; *b*, $61,250; *c*, $61,100. Geo. Hildebrand, 38 Park Row, New York, *a*, $61,800; *b*, $57,750; *c*, $53,700.

Utica, N. Y.—The Assembly, it is stated, has passed a bill authorizing Oneida County to bond itself to the amount of $1,000,000 to erect a court house.

White Plains, N. Y.—The Com. on the new Court House, it is stated, has reported to the Bd. of Superv. in favor of an entirely new building, the cost to be about $500,000.

Eaton, O.—The Town Trus., it is stated, have decided to accept the offer of Andrew Carnegie to erect a library here. Probable cost, $15,000.

Akron, O.—J. Milton Dyer, of Cleveland, it is stated, has been commissioned by the Co. Comrs. to prepare new plans for the court house, so as to keep the cost of the building within the appropriation, which is $275,000.

Springfield, O.—Robt. C. Gotwald, Gotwald Bldg., it is stated, has been directed by the Hospital Bd. to prepare plans for the contagious bldg., to be erected in conjunction with the new city hospital and to receive bids for the construction of same.

Toledo, O.—The erection of a new city hall is reported under consideration.

Harry W. Wachter, The Nasby, it is stated, is preparing plans for an armory for the Home Guards of America, to cost $60,000.

**Portland, Ore.*—F. J. Linne & John D. Carroll, of Seatle, Wash., it is reported, have received the contract to erect the Washington State Bldg. at the Lewis & Clark Exposition, at $26,791.

Coatesville, Pa.—The members of the Washington Fire Co., No. 1, of Coatesville, it is stated, have decided to erect a building to cost $25,000.

Ft. Greble, R. I.—Bids are wanted Mar. 31 for furnishing material necessary to raise building No. 21 (old post exchange), construct and place thereunder brick piers and certain walls with concrete footing, and make repairs to building as may be necessary to convert it into serviceable storehouse at this post. First Lieut. John L. Johnston, A. C., Q. M., U. S. A.

Charleston, S. C.—Bids will be received Apr. 5 by Dr. R. S. Cathcart, Chmn. Bldg. Com., Medical Society of S. C., at the office of Henry F. Cook, Supt. of Construction, for erecting Roper Hospital buildings on Calhoun and Lucas Sts.; estimated cost, $100,000. Wm. M. Aiken, Archt., 33 Union Sq.

Bristol, Tenn.—Rev. Father Meyer, it is stated, has announced that he has arranged with Bishop Donahue, of Wheeling, W. Va., for the erection of a hospital here, to be in the charge of the Sisters of Charity. Probable cost, $75,000.

Corsicana, Tex.—Bids will be received Apr. 15, by the Co. Comrs., for erecting a court house here. J. E. Flanders, Archt., Dallas. C. L. Jester, Co. Judge.

Ft. Sam Houston, Tex.—It is reported that the War Dept. has notified Capt. Lawrence J. Fleming, Constr. Q. M., at San Antonio, that bids are to be received for additional buildings to be erected at this post which will include an 8 set bachelors' quarters, a 12 company mess hall and kitchen, and special quarters for the band. The total cost to be about $100,000.

Norfolk, Va.—The erection of a new city hall to cost about $250,000 is reported under consideration.

Marion, Va.—Bids are wanted Apr. 12 for erecting a court house. Frank P. Milburn, Archt., Columbia, S. C.; J. P. Sheffey, Jr., Secy. Bldg. Com.

Portsmouth, Va.—Mrs. C. B. Ryan, of Portsmouth, wife of the Gen. Manager of the Seaboard Air Line, it is reported, has given $60,000 for the erection and equipment of 4 hospitals along the line of the R. R.

Manitowoc, Wis.—The Co. Comrs. have accepted the plans of Chris. H. Tegen, of Manitowoc, for the Manitowoc County court house, which is to be constructed of Bedford stone, and to cost about $150,000.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

Decatur, Ala.—It is reported that the R. R. Comn. has ordered the Southern Ry. Co. to build a new depot here. W. H. Wells, Engr. of Constr., Washington, D. C.

Los Angeles, Cal.—Archt. A. F. Rosenheim, Hellman Bldg., writes that bids will be received about Apr. 1, for the erection of a lodge building for the B. P. O. Elks; probable cost, $150,000.

**San Francisco, Cal.*—Mahony Bros., Crocker Bldg., it is reported, have received the contract to erect a 7-story building on Market St. for J. Kamm, to cost about $165,000. Bliss & Faville, Crocker Bldg., are the archts.

Denver, Colo.—F. E. Edbrooke Architectural Co., 510 Opera House Blk., is stated to have prepared plans for the following buildings: A 6-story brick and stone office building to be erected on 17th and Champa Sts., to cost $200,000; a 2-story addition to the building of C. Boetscher on 16th and California Sts., to cost $40,000 and a 5-story brick and stone office building on 16th and Champa Sts., to cost $300,000.

Edw. J. Wilcox, it is stated, will erect a 3-story store and apartment house at York and E. Colfax Sts. to cost about $35,000.

Norfolk, Conn.—A stock company has been formed, to be known as the Norfolk Realty Co., for the purpose of erecting a 3-story business building at Greenwoods Road and Station Pl., the third floor to be used as the lodge room of the Royal Arcanum Society. Capital, $50,000. Edmund Brown, Secy.; Alfredo S. G. Taylor is said to be the Archt.

**Items marked thus give the names of parties awarded contracts.*

New Britain, Conn.—W. W. Hanna and Elizabeth Anderson will erect this spring a brick business block with 5 stores and 15 tenements. W. H. Cadwell, Archt.

**Rockford, Ill.*—G. Maffioli, 211 E. State St., it is reported, has received the contract to erect the Solomon Blk., at about $28,000.

Moline, Ill.—Plans are being prepared, according to reports, for a 5-story brick warehouse, 171x164 ft., which is to be erected by Deere & Co., on 3d Ave., at a cost of about $100,000.

Chicago, Ill.—Holabird & Roche, 1618 Monadnock Bldg., have completed plans for the combination mercantile and office structure to be built at Jackson Boule. and State St. for M. L. Rothschild. The building will be 12 stories high, 38x100 ft., of fireproof construction, and cost $200,000.

Max Tich and Carl Roessler are having plans prepared for a 12-story building to be erected at 260 and 264 Clark St. It will be use as an addition to the Kaiserhof Hotel and Restaurant. The building will be 50x116 ft., of stone, brick and terra cotta, and cost $250,000.

A 16-story building is to be erected by the Studebaker Bros.' Mfg. Co. at Hubbard Court and Wabash Ave.

Plans are being prepared by Jarvis Hunt, Monadnock Bldg., for a 19-story, 125x190-ft. building which is to be erected at Clark and Monroe Sts. by the American Trust and Savings Bank. It is to be of brick, stone and steel, and cost $800,000.

Muncie, Ind.—Jos. A. Goddard, a wholesale grocer of this city, has plans for a 5-story business block to be erected this year, at an estimated cost of $50,000.

Indianapolis, Ind.—It is reported that the Parry Mfg. Co. will erect two 2-story brick factory buildings to cost about $47,000.

Evansville, Ind.—It is reported that bids will be received Mar. 30, by the Bldg. Com. of Elks Lodge, Courier Bldg., for erecting new Elks Home, except painting, glass and glazing, heating, electrical work and plumbing.

New Orleans, La.—Harry Watcham, of St. Louis, Mo., it is reported, is the promoter of the project to erect a 10-story hotel in this city to cost about $750,000.

Winthrop, Me.—A. G. Wing is reported to be preparing plans for a hotel to be erected at "Craig's Point," Winthrop, for Mrs. Wm. S. Butler, of Boston, Mass.

Baltimore, Md.—It is stated that an application has been made for a permit to erect the Walters Art Gallery, at an estimated cost of $300,000. It is reported that plans have been prepared by Delano & Aldrich, and that the contract for its construction has not as yet been awarded.

Fitchburg, Mass.—New England Telephone & Telegraph Co. has purchased property at Goodwin & Pleasant Sts., and contemplates erecting a new central exchange office building. Frank E. Bowker, Mgr., Fitchburg,.

**Boston, Mass.*—The Fosburgh Co., 6 Beacon St., has secured the contract for a 9-story mercantile building for the Boston Wharf Co. It will be of brick and steel construction and have fireproof floors and roof, to cost approximately $150,000.

Cambridge, Mass.—Asa P. Morse will erect a new bank building on Massachusetts Ave., at a cost of about $50,000. J. A. Hasty, Archt., Boston. No contracts awarded.

Detroit, Mich.—Pardridge & Blackwell, it is stated, have had plans prepared for a 6-story steel store building which is to be erected at Monroe and Gratiot Aves. and Farmer and Farrar Sts.

It is reported that Gustave W. Zanger will erect a store on 73 Miami St., to cost $35,000.

Grand Rapids, Mich.—The International Harvester Co. of America, it is reported, will erect this summer, at Wealthy Ave. and Buchanan St., a 3-story brick building to cost about $50,000.

Winona, Minn.—The International Harvester Co. is stated to have decided to erect a storage warehouse.

It is stated that plans are being prepared for a 6-story fireproof warehouse for Latsch & Sons, wholesale grocers.

**Jackson, Miss.*—Hooger Bros., of Montgomery, Ala., it is reported, have received the contract to erect the Capitol Natl. Bank, at Capitol and West Sts., a 3-story Bedford stone building, at about $30,000.

St. Louis, Mo.—J. J. Hannerty, it is stated, is having plans prepared by Barnett, Haynes & Barnett, Olive and 9th Sts., for a theater which he intends erecting on Grand Ave. at a cost of about $100,000.

Carthage, Mo.—It is reported that P. J. McNerney has completed plans for a $25,000 opera house.

**New York, N. Y.*—The Hooker Co. (Wm. K. Ashton, Pres.), it is reported, has purchased a site at John and Nassau Sts., and will erect a 16-story office building. The Geo. A. Fuller Co., 137 B'way., it is stated, has the contract for construction.

**Niagara Falls, N. Y.*—The following are reported to be the bids received Mar. 1 for erecting the Y. M. C. A. Bldg.: Braas Bros., $39,058 (awarded contract); Hartmann & Noblett, $40,368; Morris & Allen, $40.921; Snyder & Gillett, $41,327; Schumacher & Moyer, $43,307; Fred J. Allen, $44,696; J. Lennon & Sons, $44,771; W. J. S. Cowdrick, $45,256.

Rochester, N. Y.—Leon Stern, Chamber of Commerce Bldg., it is stated, has prepared plans for a 5-story stable which is to be erected at Allen and Fitzhugh Sts. for E. F. Higgins, at an estimated cost of $75,000.

Brooklyn, N. Y.—It is reported that the members of the Eastern Dist. Turn Verein are considering the erection of a 4-story annex to the present building on Gates and Bushwick Aves.

It is reported that plans have been prepared by Parfitt Bros., 26 Court St., for a brick and terra cotta store and apartment building which is to be erected on Myrtle Ave. and Stanhope St. by Herman Galitzka, owner. Probable cost, $50,000.

Syracuse, N. Y.—Chas. Colton, Kirk Bldg., is stated to have prepared plans for a stone foundry to be erected on Sand and Belden Sts. for the Economy Fdy., to cost $22,000.

The Great Northern Brewing Co. is stated to have decided to erect a brick brewery at Salina and Exchange Sts., to cost $45,000.

Dennison, O.—It is reported that plans of the Southwest system of the Pennsylvania lines for improvements during the coming year include the erection of a new roundhouse and additional shops at Dennison, which will cost about $300,000. Ralph Peters, Gen. Supt., Columbus, O.

Cincinnati, O.—Harry Hake, Union Trust Bldg., it is reported, has prepared plans for a building which is to be erected at 5th and Race Sts., for Col. Andrews, of Newport, Ky., at a probable cost of $200,000.

D. H. Burnham, of Chicago, Ill., it is reported, has taken an office in this city and is receiving bids for the erection of an office building for the Fourth Natl. Bank. The cost of the building is reported to be about $200,000.

Altoona, Pa.—Oliver Rothert, it is stated, has purchased a site at 12th Ave. and 12th St., and will erect a 5-story and basement building, to be used for furniture and carpet business.

Albert E. Westover, of Philadelphia, it is stated, is preparing plans for a brick and steel theater which I. C. Michler will erect on 12th Ave.

Toledo, O.—The National Land & Investment Co., in which Geo. G. Metzger is said to be interested, it is reported, intends erecting an 8-story brick combination apartment house and commercial building at Spielbusch, Canton and Shepard Sts. Walter C. Hudson, The Nasby, is said to be the archt.

A. E. Lang, it is stated, is interested in the project to erect a 2-story convention hall, 20x96 ft., which it is proposed erecting on the site of the Cherry St. market.

It is reported that during the coming summer the Clover Leaf R. R. will erect a freight station on Erie St. Fred. McArdle, Supt., Frankfort, Ind.

Akron, O.—The Albaugh Co., owners of the Grand Opera House, which was recently destroyed by fire, it is reported, intend rebuilding at a cost of about $50,000.

**Cleveland, O.*—Henry G. Slatmyer, 130 Lake St., it is reported, has the general contract to erect the addition to the plant of the Standard Brewing Co. on Train St. and Clark Ave. The entire cost of the improvement, it is stated to be about $25,000.

Youngstown, O.—It is stated that plans have been prepared for a club house for the Youngstown Golf Club to cost $75,000.

Columbus, O.—E. A. Reed, Div. Supt. of the Bell Telephone Co., it is stated, has announced that a site has been purchased on which it is proposed to erect a 6-story brick telephone exchange.

Columbus, O.—It has been reported that the Executive Com. of the American Insurance Union has decided to erect a 4-story temple at 46 W. Broad St., to cost $75,000. John J. Lentz is said to be interested in the project.

Portland, Ore.—The Marshall-Wells Co. has purchased a block on N. 13th St., bet. Irving and Johnson, upon which it will build a warehouse.

Tarentum, Pa.—The Masons of the town, it is stated, under the name of the Masonic Hall Assoc., with a capital of $50,000, it is reported, are contemplating the erection of a 3-story brick temple, to cost about $20,000.

Philadelphia, Pa.—It is reported that plans for the elevation of the Philadelphia and Reading Ry. line from Greene St. north to Huntington St., provide also for the construction by the company of 2 new passenger stations. One of these will take the place of the present Columbia Ave. station, while the other plan covers the rebuilding of the Spring Garden St. station.

*A building permit has been granted to Philip Halbach, 2530 Thompson St., to erect a 4-story beer storage house, 32x100 ft., at 1545 N. Lawrence St., to cost $24,000; also to Wm. Steele & Sons, 1600 Arch St., to erect a 7-story mercantile building at 1014 Walnut St.; cost, $100,000.

Providence, R. I.—The Churchill House Corporation (Mrs. Edw. Johnson, of Central Falls, Pres.), it is reported, has accepted the plans prepared by Thornton & Thornton, 152 Weybossett St., for a 3-story brick and terra cotta club house which is to be erected on Angell St. Capital $50,000.

Nashville, Tenn.—Plans have been submitted to the Bldg. Dept. for the Methodist Publishing House which is to be erected at 9th Ave. and Broad St., at a cost of $100,000.

Ogden, Utah.—It is stated that plans have been prepared for a warehouse to be erected here by the Simmons Hardware Co., of St. Louis, Mo.; probable cost of building, $75,000.

Provo City, Utah.—It is reported that the Independent & Bell Telephone Companies, will erect a $50,000 building here if the Council grants a franchise to erect poles, etc.

Spokane, Wash.—See "Electric Railways.

Milwaukee, Wis.—The Schlitz Brewing Co. has purchased ground at 2d and Sycamore Sts., and will erect a 5-story, fireproof building this spring, 100x150 ft., to cost $100,000.

Geo. Ehlers, 758 3d St., it is reported, is completing plans for the $75,000 auditorium which is to be erected at 8th and State Sts. by Cotzhausen Bros.

Winnipeg, Man.—Bids will be received until Mar. 25 by J. E. Schwitzer, Div. Engr., Canadian Pacific Ry., Winnipeg, for erecting several buildings, including section houses, freight sheds, etc.

Montreal, Que.—A building permit has been granted to the Mount Royal Club to erect a 2-story building 78x107 ft., at Sherbrooke and Stanley Sts., to cost $120,000.

Toronto, Ont.—Bids are wanted Mar. 21 for erecting large additions to foundry. E. J. Lennox, Archt., 71 Yonge St.

NEW YORK, N. Y.

194 Chrystie St, 6-story br and stone stores and tenemts; c, $35,000; o, Elias A Cohen; a, Horenburger & Straub.

35 Maiden Lane, 11-story br and stone office bldg; c, $200,000; o, Albert Lorsch; a, Louis Korn.

311 E 3d St, 2 6-story br and stone stores and tenemts; total c, $100,000; o, Jacob Fish, a, Sass & Smallheiser.

7th Ave and 49th St, 2-story br and stone stores and garage; c, $40,000; o, F S Godfrey; a, L C Holden.

119th St and 3d Ave, 5-story br and stone store and tenemt; c, $45,000; o, Charles Realty & Constr Co; a, Moore & Landsiedel.

36 W 100th St, 3-story br and stone stable and dwell; c, $20,000; o, Schinasi Bros.; a, Gillespie & Carrel.

8th Ave and 148th St, 2 5-story br and stone stores and tenemts; total c, $105,000; o, Robt Arnstein; a, Geo F Pelham.

Bassford Ave and 183d St, 6-story br stores and tenemt; c, $50,000; o, Bassford Realty Co; a, J J Vreeland.

Longwood and Prospect Aves, 6-story br stores and tenemts; c, $150,000; o, John McGrath; a, Jas F. Meehan.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

Hot Springs, Ark.—The members of the Central Methodist Church, it is stated, are considering the rebuilding of the edifice which was destroyed by fire, the new structure to cost about $50,000. Rev. Lewis Powell, Pastor.

Los Angeles, Cal.—The congregation of the Betnesdan Presbyterian Church, it is reported, intends erecting a new edifice to cost $20,000. Rev. J. M. Newell, Pastor.

Chicago, Ill.—The members of the Methodist Church, it is stated, are contemplating the erection of a $25,000 mission building at Milwaukee and W. Chicago Aves. to cost about $25,000. S. B. Shaw may be able to give further information.

Champaign, Ill.—It is reported that bids are wanted Apr. 1 for erecting M. E. Church on site of Parks Chapel. Spencer & Tempple, Archts., I. O. O. F. Bldg.

Chicago, Ill.—Laverne W. Noyes will build a $100,000 residence on Lake Shore Drive north of Elm St.

The southeast corner of Calumet Ave. and 49th St. is to be improved with a 4-story apartment building according to plans prepared by Alexander L. Levy, 112 Clark St. It will be 46x125 ft., and cost $40,000.

J. Ogden Armour is having plans prepared for a new residence to be built at Lake Forest. Probable cost, $250,000.

Frost & Granger, 184 La Salle St., have prepared plans for an apartment building to be erected at 66th St. and Normal Ave., for E. P. Straudberg, at a cost of $55,000. The building will be 3 stories high, 113x125 ft., and will be built of brick and stone.

Jos. T. Fortin, New Era Bldg., is the architect of a 3-story apartment building, 82x90 ft., to be built at 3148-54 Verona Ave., at a cost of $40,000.

Patton & Miller, 140 Dearborn St., have completed plans for a building to be erected at Wilson Ave. and Sheridan Road for the North Shore Congregational Church. Estimated cost, $40,000.

Robert L. Martin, Jr., will build 2 fine apartment houses on Washington Boule. and 51st Ave. Both buildings will be 2 stories high, of stone and pressed brick, and the aggregate cost will be about $100,000.

Bishop & Co. have prepared plans for a 3-story apartment building to be erected at 66th St. and Washington Ave., for Simon Straus. Cost, $100,000.

C. W. Van Keuren, 119 La Salle St., has designed 3 flat buildings which Otis Goddard will erect this spring in Edgewater. Each will be 3 stories high, 57x67 ft., and the total cost to be about $70,000.

E. E. Postle, 204 Dearborn St., is preparing plans for the Calvary Presbyterian Church, which is to be built at Jackson Boule. and 46th Ave. It is to be a brick and stone structure, 75x125 ft., and cost $65,000.

Patton & Miller, 140 Dearborn St., are the architects of the new Congregational Church of Hinsdale, to be built in that suburb early next summer. Cost, $40,000.

Wm. L. Bush, it is stated, has purchased a site at Dearborn Ave. and Division St., and intends erecting an 11-story brick and terra cotta apartment house to cost about $700,000.

Hartford, Ind.—It is reported that bids are wanted Mar. 30 for erecting an edifice for the members of United Brethren Church. Address Rev. J. A. Bray.

**Brazil, Ind.*—It is reported that th tract to erect the Winklepleck Blk. has awarded to Geo. Hadley, of Brazil, at 769.

Des Moines, Ia.—It is reported that Hallet is contemplating the erection of apartment house on Locust St. to cost $40,000.

**Davenport, Ia.*—The contract to erect Edwin Pape apartment house at 13th Main Sts., it is stated, has been awarde C. E. Osborne, 1215 Harrison St. at $17,000.

Clinton, Ia.—It is stated that bids wanted Mar. 30 by Rev. J. A. Murray, St. Patrick's R. C. Church, for erecting edifice and rectory. Schick & Roth, La Crosse, Wis.

New Orleans, La.—The Carondelet Methodist Church has purchased a site St. Charles Ave. on which it is proposed ing a new edifice to cost about $50,000.

Baltimore, Md.—T. Buckley Ghequier, Baltimore, it is stated, has prepared for a parish house and chapel to be as an addition to the Mt. Calvary Church Madison and Eutaw Sts. Cost, $25,000.

Worcester, Mass.—Edw. Topanelian, Mutual Bldg., it is stated, has prepared for a 5-story apartment house which Jorjorian will erect on Wellington St.

Cambridge, Mass.—F. D. Fiske will one or more 6-flat apartment houses on herst St.; cost about $14,000 each. C McClare, Archt., Cambridge.

Springfield, Mo.—Schmook & Culler have contemplation the erection of a $100,000 on Walnut and South Sts.

St. Louis, Mo.—A building permit has granted to the Doris Realty Co. to erect apartment houses, one at 4256 Maryland and the other at 322 N. Boyle Ave. are to be 3 stories high and are estimated cost $30,000 and $20,000, respectively.

Newark, N. J.—R. Bottelli, 191 Market it is reported, has prepared plans for story pressed brick apartment house erected at 96 Quitman St. at a cost of 000. Morris Miller, owner.

Far Rockaway, L. I., N. Y.—Horgan & tery, 1 Madison Ave., N. Y. City, it is stated have prepared plans for a residence erected on Reed Lane at a cost of for F. Haberman.

**Portsmouth, O.*—The plans of Richard McCarty & Bulford, of Columbus, have accepted for an edifice for the R. C. Church of the Holy Redeemer.

**Dayton, O.*—The F. A. Requarth Monument & Sears Sts., it is stated, secured the contract to erect the St. Mary R. C. Church on Xenia Ave. The cost of structure, including furnishing, is to be $90,000.

Mansfield, O.—The vestry of the Episcopal Church, it is stated, is contemplating the erection of a new edifice at W. and Bowman Sts., and is having plans pared by Bernon Redding. Probable $25.000.

Homestead, Pa.—J. Wm. Barnes, a estate man, is reported interested in the tion of 100 houses at Homestead Park, joining Homestead.

Allegheny, Pa.—The congregation of St. Paul's Evangelical Lutheran Church, stated, is contemplating the erection of edifice of brick and stone on Sandusky and Montgomery Ave., to cost $40, Rieger & Currier, 314 4th Ave., Pittsburg, said to be archts.

Bethlehem, Pa.—It is reported that Bethlehem Steel Works intends erecting Bethlehem 960 2-story brick dwellings for employes. It is reported to be the intent of the company to erect 480 this year the remainder next year, the total cost to about $1,500,000.

**Shamokin, Pa.*—The East End Lumber of Shamokin, has secured the contract erecting the Greek Catholic Church, for $ 447.

Sioux Falls, S. D.—The Roman Catho of the diocese (Right Rev. Thos. O'Gorm Bishop), it is reported, are considering erection of a cathedral to cost about $200,

**Chattanooga, Tenn.*—J. T. Lupton, stated, has awarded the contract to erect 5-story apartment house at Georgia and Callie Sts. to Geo. C. Long, of Buffalo, N. at $107,000.

Ft. Worth, Tex.—It is reported that a eaifice is to be erected by the members of First M. E. Church to cost about $20, Rev. Alonze Monk, Pastor.

Milwaukee, Wis.—The congregation of Temple B'ne Jeshurun, it is stated, has cided to remodel and enlarge the Temple cost of about $25,000.

Milwaukee, Wis.—Leiser & Holst, Germ Bldg., it is reported, are preparing plans a brick and stone church to be erected for congregation of the Evangelical Luth Church of the Holy Ghost, at 6th and cordia Sts., at a cost of $18,000.

NEW YORK, N. Y.

80 Cannon St, 6-story br and stone tene c, $30,000; o, J E & R B Roosevelt; a, L C Maurer.

146 Clinton St, 6-story br and tenemt; c, $25,000; o, Louis Frank; a, B stein & Bernstein.

66th St and 1st Ave, 2 6-story br and tenemts; total c, $70,000; o, E & H Ma a, Sass & Smallheiser.

Items marked thus give the names of parties awarded contracts.

St, 5½-story br and stone
00,000; o, C. W. Luyster; a,
an.
th St, 2 6-story br and stone
l c, $80,000; o, Robt Friedman;
Bernstein.
9th St, 6-story br and stone
0,000; o, Barnett Osk; a, Bern-
tein.
son Ave, 6-story br and stone
50,000; o, Wm Lane; a, Adolph

Ave and 107th St, 6-story br
nemt; c, $50,000; o, Gustave M
Levitan & Fischer.
nd B'way, 5 5-story br and stone
tal c, $175,000; o, David L
a C Sommerfeld.
and Lenox Ave; 3 6-story br
enemts; total c, $120,000; o,
la; a, Louis C Maurer.
nd Lenox Ave, 3 6-story br and
s; total c, $105,000; o, Goldberg
Horenburger & Straub.
and 8th Ave, 3 5-story br and
s; total c, $103,500; o, Fleisch-
Co; a, Geo F Pelham.
Ave and 164th St, 2 5-story
e tenemts; c, $80,000; o, I L
Levitan & Fischer.
and St Ann's Ave, 6 5-story br
al c, $300,000; o, Lorenz & Wm
Moore & Landsiedel.
and 170th St, 6-story br tenemt;
o, The Begrich Schorn Realty &
a, John Hauser.
and 138th St, 2 5-story br
al c, $74,000; o, Cornelia B Rob-
Robinson & Son.

SCHOOLS.

anged Alphabetically by States.

Ala.—The Bd. of Trus. of the
Synodical College, it is stated,
d a site and accepted plans pre-
H. D. Breeding, of Birmingham,
e building which is to cost about

.—The following bills have been
the State Legislature: Senate—
ng $40,000 for improvements at
geles Normal School and $25,000
l of forestry in State University.
Appropriating $30,000 for the
nt in Southern California of a
icultural experimental station of
University; $150,000 for the erec-
agricultural building at the State
$10,000 for a heating plant at
State Normal School, and $30,000
ry and gymnasium in connection
n Jose State Normal School.

ncisco, Cal.—The Governor, it is
s signed a bill appropriating $150,-
e purchase of a site and the erec-
nent and purchase of buildings for
School.

Conn.—It is stated that bids will
until Mar. 23 by A. A. Peck, for
mplete, except plumbing, an 8-room
l. Wm. D. Johnson, Archt., Hart-

ton, D. C.—Bids are wanted Mar.
ting an 8-room school. John Bid-
D. C.

Ill.—St. Jacobi German Lutheran
n (Rev. Carl Schmidt, pastor), has
build a 3-story brick parochial
arfield Ave. and Fremont St. Cost,

e, Kan.—A gymnasium is to be
the Univ. of Kansas (F. Strong,
cost about $100,000.

ton, Me.—At the town meeting held
th, it is reported that the citizens
favor of issuing $30,000 bonds to
h school.

ll, Me.—The Maine Industrial
Girls is reported to have received
ppropriation of $12,000 for the con-
of an administration building.

Mass.—It is stated that bids will
d until Mar. 27 by the Schoolhouse
or erecting completed (including
electrical work, ventilating and
primary school, Lewis Dist., Rox-
Clipston Sturgis, Chmn.

er, Mass.—Bids will be received
y Geo. C. Halcott, Supt. Pub. Bldgs.,
ng a 4-room addition to Abbott St.

ield, Mass.—Bids will be received
by the City Property Com., for in-
plumbing in new Technical High
W. A. Ford, Chmn.

e, Mass.—Bishop Thos. D. Beaven,
field, it is reported, plans to erect
ildings at Brightside for education-
ses, to include a trade school, the
to be about $100,000.

Mass.—W. W. Duncan, Pres. School
es that the plans for a 10-room
be erected in Centralville prepared
P. Graves, 38 Middlesex St., have
pted; cost, $60,000.

o, Mich.—The contract to erect the
School, it is reported, has been
to Call Bros., of Mt. Pleasant, at

otte, Mich.—The School Bd., it is
ill receive bids until Mar. 20 for
chool bonds.

ud, Minn.—Governor Johnson, it is
has signed a bill appropriating $50,-
the erection of a dormitory at the
d Normal School to replace the
which was destroyed by fire.

burg, Miss.—It is reported that the
has been authorized to receive bids
. 4 for erecting a school in the 3d
cost $16,000.

St. Louis, Mo.—The following are reported to be the lowest bids received by the Bldg. Com. of the Bd. of Educ., on Mar. 10, for school improvements: Elleardsville school: General work, E. C. Gerhard, $140,450; plumbing, Philip C. Ring, $10,453; heating and ventilating, B. F. Sturtevant & Co., $16,450. Franz Sigel school: General work, Fred Boeke, $127,800; plumbing, Fink & Schuster Plumbing Co., $9,770; heating and ventilating, B. F. Sturtevant & Co., $16,400.

Newark, N. J.—Bids will be received Mar. 24 by J. H. Bacheller, City Compt., Rm. 5 City Hall, for $370,000 school bonds.

New Brighton, S. I., N. Y.—Bids will be received Mar. 27 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for erecting School No. 33, Boro. Richmond.

Rochester, N. Y.—Plans are being prepared for a 2-story brick convent building which is to be erected for the Immaculate Conception Parish Parochial School, the cost to be about $20,000. Rev. Father O'Neil may be able to give further information.

**Glens Falls, N. Y.*—The Bd. of Educ., it is reported, has awarded the contracts for work in connection with the erection of the high school as follows: Wm. A. Burnham, of Glens Falls, foundation, etc., $13,150, and carpenter, mason work, etc., at $55,540; Geo. E. Adams & Co., Glens Falls, plumbing, ventilating and heating, $21,355; and Trussed Concrete Steel Co., Buffalo, concrete work, $18,590.

Brooklyn, N. Y.—Bids will be received Mar. 27, by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for erecting School No. 6.

New York, N. Y.—The following are the bids opened on Mar. 13 by C. B. J. Snyder, Supt. School Bldgs., for installing ventilating and heating apparatus in DeWitt Clinton High School, Manhattan Boro.: Blake & Williams, $66,640; United Htg. Co., $68,807; Geo. A. Suter, 112 Wooster St., $59,864 (awarded contract); Evans, Almirall & Co., $66,887; Rossman & Bracken Co., $68,000; E. Rutzler Co., $60,419; Walker & Chambers, $63,878; N. Y. Steam Fitting Co., $73,746; Wm. N. Tobin, $70,599; Francis Bros. & Jellett, Inc., $73,978.

*Ralph J. F. Gerstle Co., 347 E. 44th St., has secured the contract for completing the installation of the ventilating and heating apparatus in School No. 31, Manhattan Boro. (bids opened Mar. 13) for $3,500.

Bids will be received Mar. 27 by C. B. J. Snyder, Supt. School Bldgs., for installing ventilating and heating apparatus in School No. 83, Boro. Manhattan.

Schenectady, N. Y.—J. McDonald, City Clk., writes that all bids opened on Mar. 9 for the ventilating, heating, plumbing and electric wiring for the Eastern Ave. High School exceeded the amount appropriated. New bids will probably be called for.

Bids are wanted Mar. 29 for $15,000 school bonds. Olin S. Luffman, Compt.

Ithaca, N. Y.—The date of opening of bids for constructing the N. Y. State College of Agriculture at Cornell University, has been extended from Apr. 3 to Apr. 10, as advertised in The Engineering Record. E. L. Williams, Treas. of University.

Chapel Hill, N. C.—The Executive Com. of the Trus. of the Univ. of N. C., it is reported, has appointed a committee, of which R. H. Battle is a member, to award the contract for the $50,000 chemical laboratory which is to be erected at the Univ.

Steubenville, O.—Christie & Webster, of Steubenville, it is reported, have prepared plans for the high school which it is proposed erecting at a cost of about $80,000.

Wilmington, O.—The citizens, it is reported, have voted in favor of issuing bonds to erect a school to cost $20,000.

Cincinnati, O.—It is reported that Tietig & Lee, Commercial Tribune Bldg., have been directed by Pres. Chas. W. Dabney, of the Univ. of Cincinnati, to prepare plans for a 3-story 80x115 ft., of gray or red brick, building for class rooms and laboratories for the Technical School at the Univ. Probable cost, $60,000.

Marion, O.—Wilbur T. Mills, of Columbus, it is stated, has submitted plans for a school to cost $25,000. B. D. Dickerson is a member of the School Bd.

Columbus, O.—Bids will be received Mar. 27, by the Bd. of Educ. (C. E. Morris, Chmn. Com. on Bldgs.), for furnishing material and installing 2 new steam boilers in Mound St. School.

Harrisburg, Pa.—Bids will be received Mar. 20, by the Com. on Finance of Bd. School Dirs., for $85,000 school bonds. D. D. Hammelbaugh, Secy.

**Elkins Park, Pa.*—The School Bd. of Cheltenham Township,* it is reported, has awarded the contract to erect a high school in Elkins Park, to Henderson & Co., of Philadelphia, at $68,222.

**Philadelphia, Pa.*—It is reported that the contract to erect the Southern Manual Training School has been secured by Cramp & Co., 1421 Filbert St., at $361,937.

It is stated that negotiations are about completed for the erection of an annex to the Girls' Commercial High School at Broad and Green Sts., for which $353,000 has been appropriated.

*A building permit has been granted to Lynch Bros., 46 N. 12th St., to erect a 3-story brick annex to school at Lawrence and Race Sts., to cost $53,500, and also to Henderson & Co., 1221 Arch St., to erect a 3-story granite school at 57th and Spruce Sts., to cost $80,000.

Myerstown, Pa.—It is reported that the Albright College is to be enlarged, at a cost of about $100,000. J. Woodring, Pres.

Chattanooga, Tenn.—We are informed that there is no truth in the report that the Trustees of the Grant University have decided to erect a $25,000 building to be used as a College of Liberal Arts.

Memphis, Tenn.—Alsup & Wood, Randolph Bldg., have prepared plans for the Goodwin Institute, to cost $350,000.

West Allis, Wis.—Bids will be received Mar. 23 by the Dist. Bd. of Joint School Dist. No. 5 for erecting a brick school on National and Wauwatosa Aves. Address Fred W. Henderson, Clk., P. O. address West Allis.

Ste. Anne de Bellevue, Que.—Sir. Wm. MacDonald, of Montreal, it is reported, has decided to give $4,000,000 to the cause of education in the Province of Quebec, to be used as follows: To erect a normal school at Ste. Anne de Bellevue, with 2 large residential buildings, one for each sex, and the erection and endowment of an extensive agricultural college at the same place.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Sacramento, Cal.—Local press reports state that bids will probably soon be asked, for the construction of a garbage crematory.

Plainfield, N. J.—Local press reports state that bids will be received Mar. 23 by the Common Council, for sprinkling streets of city during coming season.

**Long Island City, L. I., N. Y.*—Press reports state that the contract for the new garbage crematory for the 4th Ward, Queens Boro. (bids opened Mar. 6) has been awarded to Wm. Nolan, 375 Fulton St., Brooklyn, for $24,950. It is to be located at South Jamaica.

Dayton, O.—Bids will be received Mar. 24 by the Bd. Pub. Service, for sprinkling with water portions of numerous streets. Wm. F. Miller, Clk.

York, Pa.—Bids will be received Mar. 21 by the Sanitary Com., for collection and removal of garbage for fiscal year beginning Apr. 3, 1905. S. Horace Gotwalt, Secy., 121 S. Beaver St.

Winnipeg, Man.—Bids will be received by the Chairman Com. on Works, on Mar. 28, for the construction and delivery of 6 sprinkling wagons, as advertised in The Engineering Record.

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

See also "Civil Sundry Appropriations."

The Carnegie Steel Co., Youngstown, O., has under discussion the increasing of its power plant, but nothing definite has been decided. It has, however, been decided to increase its storage battery from 1,600 amperes per hour capacity to 2,400. Thos. McDonald, gen. supt.

The Chapel Mills Mfg. Co., Cherry Valley, Mass., will build a 3-story, 120x60-ft. addition to its Bottomly Mill. The capacity of the power plant is to be 300 h.p.

The Vulcan Mine Car Co., Ltd., Windber, Pa., expects to build a new plant this spring on the main line of the Pennsylvania R. R. Plans have not yet been completed.

The Laketon Sand Brick Co., North Manchester, Ind., will erect a one and two-story, 50x150-ft. building, to have a capacity of 80,000 brick every 24 hours. The power plant will consist of a 125-h.p. engine and two 100-h.p. boilers.

The Columbus Heating & Ventilating Co., 584-586 So. High St., Columbus, O., proposes to erect a 2-story, 120x189-ft. building. Machinery will be removed from the company's present plant, but a number of new machines, such as sheet-metal working machines, will be required. The matter of machinery will not be taken up for 30 or 60 days.

The Union Trunk & Bag Co., Manchester, Va., has bought a 4-story, 160x65-ft. building in Richmond, to which it intends to build an addition. The company will require woodworking machinery, blowers, etc.

The Beaumont, Tex., Rice Mills contemplate erecting a 54x60-ft. building. The boiler capacity will be 300 h.p. and the engine capacity 300 h.p.

A building permit has been granted to Frederick Herkert for a 4-story, 69x138-ft. trunk factory at 609-613 Chouteau Ave., St. Louis. Newspaper reports state that the cost is to be $23,000 and that the work is to be done by M. W. Muir.

The Holly Construction Co. is now building at Holly, Colo., a 600-ton beet-sugar factory for the Holly Beet Sugar Co. About 2,500 h.p. of boilers will be installed and the engines, generators, etc., usual in such a plant. Buildings will be fireproof, of steel, concrete and brick construction, and the plant will be belt driven.

The Federal Improvement Co., 145 La Salle St., Chicago, Ill., is taking figures for the erection of an electric motor hoist and ash conveyor in the plants of the Glucose Sugar Refining Co.

The Thomasville, N. C., Chair Co. is erecting a 2-story, 280x40-ft. factory, which will have a daily capacity of about 1,200 chairs.

The Schwarzschild & Sulzberger Co., 45th St. and First Ave., New York, will install two boilers and a direct-connected engine unit.

The Beatrice Cotton Mills, Meridian, Miss., has been organized, with a capital stock of $400,000. It is proposed to erect a plant to have 20,000 spindles and 600 looms, and to install a 1,200-h.p. steam turbine. T. E. Rivers, secy.

A bill has been passed appropriating $35,000 for the purchase of material and machinery for the State Printing office at Sacramento, Cal.

For ice plant at Hamilton, Tex., see "Power Plants, Gas & Electricity."

The Nazareth, Pa., Cement Co. proposes building an extension to its mill.

Louis B. Magid, 342 Equitable Bldg., Atlanta, Ga., will erect a silk mill, the equipment for which will cost about $200,000. A large water power on the Tugaloo River will be developed. Ralph D. Mershon, 11 Pine St., New York, is the engineer.

The Hay Foundry & Iron Works, Newark, N. J., are about to build a 130x400-ft. structural shop, a 50x80-ft. template shop, a 50x80-ft. power house, trestle, coal pockets, crane runways, etc. Prices are wanted on machinery, cranes, etc.

The Wheeling & Lake Erie R. R. has ordered for its new shops at Canton, O., a 150-kw. and a 75-kw. Bullock generator and 16 Bullock motors.

The Chicago & Northwestern Ry. Co. has placed an order with Allis-Chalmers Co., for two Reliance 32x36-in. belted engines and two 250-kw. direct current Bullock generators. These will be installed as two separate units in the power house of the company at Buxton, Iowa, and used for driving machinery in the coal mines there, which furnish fuel for some of the Western divisions of the road.

Wm. Penn & Co. Superior, Wis., will erect a 50x75-ft. sawmill and install a 75-h.p. Corliss engine and a 150-h.p. boiler, sawmill machinery and later a planer.

Schuster Bros., Rochester, Minn., will erect boiler, brew and wash houses, and install two 18-ft. tubular boilers of 72-in. diameter, and a water heater.

The Mitchell-Diggins Iron Co., Cadillac, Mich., expects to erect a furnace with a daily capacity of 100 to 125 tons. Julian Kennedy, of Pittsburg, will have entire charge of the erection of the plant, including the letting of all contracts.

H. W. Coffin, Addison, Me., will erect a boat-building plant in Beaumont, Tex., next fall. Definite plans will not be decided for some time.

The Union Stopper Co., Morgantown, W. Va., will erect some new buildings and put in a furnace room 80 ft. square. The balance of the plant will be remodeled as required. C. N. Brisco, 60 W. 98th St., New York, pres.

The Wisconsin Portland Cement Co., recently incorporated with $750,000 authorized capital, and headquarters at Portage, Wis., will begin the erection of a plant at Lake Ennis, near that city, sometime in the fall. The materials, marl and clay, found in close proximity, have been pronounced satisfactory by Prof. R. C. Carpenter and Prof. S. B. Newberry. An eight-kiln plant will be constructed. The officers are: S. T. Meservey, president; S. M. Babcock, vice-president; F. H. Merrell, secretary; Joseph Hainsworth, treasurer; Joseph M. Boyd, auditor.

The Lackawanna Steel Co. has ordered three vertical cross-compound blowing engines for the extensions of its Lackawanna, N. Y., furnace plant. These will have 46 and 86 in. cylinders, 84-in. air cylinders and a 60-in. stroke, and will be built at the Scranton shops of the Allis-Chalmers Co.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

See also under "Civil Sundry Appropriations."

Bakersfield, Cal.—The State Senate has passed the bill appropriating $60,000 for the erection of embankment at levees to care for flood waters of Kern River, in Kern County.

San Francisco, Cal.—The following are the bids opened on Mar. 3 by the California Debris Comn. (Capt. Wm. W. Harts, Corps Engrs., U. S. A., Secy.), for furnishing, etc., 3,000 bbls. Portland cement for Barrier No. 1, Yuba River, Cal.: (*a*) brand; (*b*) price per bbl. or per 4 sacks of cement; (*c*) price deducted for return of 1 bbl. or 4 sacks; (*d*) hauling 3,000 bbls. (or 12,000 sacks) of cement from Marysville, Cal., to Barrier No. 1, Yuba River, Cal., and storing same at the latter place, per bbl. or 4 sacks: Western Fuel Co., San Francisco, *a*, Standard; *b*, $2.25; *c*, 20 cts.; *d*, 95c. G. W. McNear, San Francisco, *a*, Scale or Dragon; *b*, $2.40. Henry Cowell Lime & Cement Co., San Francisco, *a*, Golden Gate; *b*, $2.25; *c*, 20c. H. M. Kupser & B. Kupser, Sr., Marysville, *d* (2 bids), 95 cts. per bbl., 86 cts. per 4 sacks. A. F. Folsom, Browns Valley, *d*, 80 cts. Hugh McGuire, Marysville, *d*, 76 cts. Geo. S. Risher, Browns Valley, *d*, 73½ cts. J. R. Garrett Co., Marysville, *d*, 85 cts.

Washington, D. C.—See "Power Plants, Gas and Electricity."

****Items marked thus give the names of parties awarded contracts.***

Washington, D. C.—Bids will be received at the office of the Comrs. D. C., on Mar. 27, for furnishing and erecting coal and ash handling machinery for the sewerage pumping station, as advertised in The Engineering Record.

Bids will be received Apr. 11 at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing at navy yards, Portsmouth, N. H.; Boston, Mass.; League Island, Pa., and Norfolk, Va., a quantity of machine tools, as follows: Air compressor, motor drive outfits, engine lathes, pipe machine, bending machines, electric whip hoists, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

**Jacksonville, Fla.*—The Marine Engine & Machine Co., of New York, N. Y., has secured the contract for passenger elevators for the U. S. Post Office, for $5,125.

Chicago, Ill.—Bids will be received Mar. 23 by the Dept. Pub. Wks., for furnishing material and erecting 2 speedy passenger elevators, one at south, the other at north end of city hall building. F. W. Blocki, Comr.

Bids will be received Mar. 22 by the Bd. Trus. of Sanitary Dist. of Chicago, for $2,000,000 Sanitary Dist. bonds. S. D. Griffin, Clk.

Lyndon, Ill.—A. P. Holt, City Clk., writes that it is proposed to construct a dam on Rock River. Engineer, Hal. Green, of Morrison, Ill.

New Orleans, La.—All bids opened on Mar. 9 by the Bd. of Comrs. of the Port of New Orleans (Hugh McCloskey, Pres.) for constructing the Henderson St. Steel shed, have been rejected and new bids will be received Mar. 28. The lowest bid received was that of the American Bridge Co., for $14,629. J. F. Coleman, Eng., 920 Hibernia Bank Bldg.

Baltimore, Md.—The City Council on Mar. 6 passed the $1,000,000 park extension loan ordinance.

Ft. Revere, Mass.—Bids will be received by Col. W. S. Stanton, Corps Engrs., U. S. A., Boston, Apr. 14, for furnishing Portland cement, broken stone and sand at Ft. Revere, as advertised in The Engineering Record.

Boston, Mass.—It is stated that bids will be received until Mar. 20 by Jas. Donovan, Supt. of Sts., for furnishing bank gravel and sand between Mar. 22, 1905, and Feb. 1, 1906.

St. Joseph, Mo.—The Bd. of Park Comrs. is reported to be considering the improving of the park system, at a cost of $20,000.

Newark, N. J.—Local press reports state that bids will be received Mar. 23 by the Bd. Freeholders, for $500,000 bonds, to be used in acquiring tracts of land added to South Mountain Reservation, and to developing plans begun in other parks.

**New York, N. Y.*—The following are the bids opened on Mar. 10 by the Dept. of Docks & Ferries, for removing present pier and building a new pier bet. Maiden Lane and Burling Slip, to be known as Burling Slip Pier West, Pier No. 15: Wm. H. Jenks, $59,857; G. B. Spearon, $59,767; R. P. & J. H. Staats, $58,212; Snare & Triest Co., 39 Cortlandt St., $56,863 (awarded contract), and Bernard Rolf, $59,293.

**Albany, N. Y.*—Winslow M. Mead, Deputy Supt. of Pub. Wks., writes that contracts for the N. Y. State Canal Improvement were awarded on Mar. 13 as follows: Contract No. 2 (opened on Dec. 15), to Ferguson Contr. Co., 69 Wall St., New York City, for $852,330; Contract No. 3, (opened Dec. 16), to Sundstrom & Stratton, 143 Liberty St., New York City, $670,497, and Contract No. 5 (opened Dec. 15), to Lindon W. Bates, 74 B'way, New York City, $381,987. For detail bids received for this work, see issue of The Engineering Record, Dec. 24.

Long Island City, L. I., N. Y.—Bids will be received Mar. 27 by Jos. Cassidy, Pres. Boro. Queens, for furnishing and delivering to Bureau of Highways 3,000 cu. yds. broken stone of trap rock, ¾ in., at Rockaway, 5th ward; also for furnishing and delivering broken stone and screenings of trap rock in Boro. Queens; requiring 10,000 cu. yds. trap rock screenings, 5,000 cu. yds. 1½ in., and 5,000 cu. yds. ¾-in. broken stone trap rock.

St. George, S. I., N. Y.—The following are the bids opened on Mar. 13 by the Dept. Docks & Ferries, N. Y. City, for furnishing labor and material required for preparing for and removing present ferry structures at St. George and building new ferry structures, and for dredging (bidders all of Manhattan Boro.): Seely-Taylor Co., 78 Broad St., $366,200; Geo. B. Spearin, 17 Battery Pl., $469,067; Bernard Rolf, 39 Cortlandt St., $512,413, and Geo. W. Rogers, 44 B'way, $546,340.

Long Island City, L. I., N. Y.—The Fin. Com. of the Bd. of Aldermen of N. Y. City, has made a favorable report on the proposition to appropriate $62,800 for the extension of the fire alarm system for Queens Boro.

New York, N. Y.—Bids will be received Mar. 27 by Maurice Featherson, Comr. of Docks, for furnishing material, preparing for and constructing a lateral extension to westerly side of pier No. 32, East River.

Philadelphia, Pa.—Bids will be received Apr. 11, at the Bureau Supplies and Accounts, Navy Dept., Washington, D. C., for furnishing at the navy yard, League Island, an equipment for new foundry, consisting of a cupola, blowers, pit for crucible furnaces, cranes, crane, ladle, brick stacks, brakes, girders, freight elevators, etc., H. T. B. Harris, Paymaster Gen., U. S. N.

Memphis, Tenn.—Bids will be received Mar. 25 by the St. Francis Levee Bd., 162 Randolph Bldg. (Richard B. Barton, Secy.) for $250,000 levee bonds.

Bremerton, Wash.—Bids will be received May 6 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for constructing a concrete quay wall at navy yard, Puget Sound; appropriation available, $51,000.

Panama.—Bids will be received Apr. 3 by the Isthmian Canal Comn., at the office of Maj. H. J. Gallagher, U. S. A., Purchasing and Shipping Agent, Washington, D. C., for furnishing sanitary and roughing materials.

Manilla, P. I.—The War Dept. is stated to have on Mar. 10 sold to the Mercantile Trust Co., of St. Louis, Mo., the entire issue of $2,500,000 public work and improvement bonds.

PROPOSALS OPEN.

For Proposals see pages 28, 29, 30, 34 and 39.

Bids Close.	WATER WORKS.	See Eng. Record.
Mar. 20.	Meeker, Colo. Adv. Feb. 18 to Mar. 18.	Mar. 4
Mar. 20.	Laying pipe, Holden, Mass.	Mar. 4
Mar. 20.	Boyce, La., Adv. Feb. 25	Feb. 25
Mar. 21.	Pipe, etc., Reading, Pa.	Mar. 18
Mar. 21.	Mains, Waterbury, Conn.	Mar. 18
Mar. 21.	Valves, Cleveland, O. Adv. Mar. 11.	Mar. 11
Mar. 21.	Hydrants, Cleveland, O. Adv. Mar. 11.	Mar. 11
Mar. 21.	Well, Ft. Caswell, N. C. **Adv. Feb. 4 to 18.**	Feb. 4
Mar. 22.	Newcastle, Neb.	Mar. 18
Mar. 22.	Aberdeen, Miss. Adv. Mar. 11.	Mar. 11
Mar. 23.	Howell, Neb.	Mar. 18
Mar. 23.	Clare, Mich. Adv. Mar. 11.	Mar. 11
Mar. 23.	Boilers, Barnesville, O.	Mar. 4
Mar. 24.	Boiler and Pump House, etc., Ft. Casey, Wash.	Mar. 11
Mar. 25.	North Ft. Worth, Tex.	Mar. 18
Mar. 25.	Oakes, N. D.	Mar. 4
Mar. 25.	Alpena Mich. Adv. Mar. 4 to 18.	Mar. 4
Mar. 25.	Pipe, valves, etc., Ft. Assinniboine, Mont.	Mar. 4
Mar. 28.	New Albany, Miss. Adv. Mar. 18.	Mar. 18
Mar. 28.	Coal pocket, etc., Atlantic City, N. J. Adv. Feb. 25, Mar. 4.	Feb. 25
Mar. 29.	Supplies, Bradley, Ill.	Mar. 18
Mar. 29.	Ft. Sill, Okla, Ter.	Mar. 4
Mar. 31.	**Meters, Pocatello, Idaho.** Adv. Jan. 28 to Feb. 18.	**Jan. 28**
Mar. —.	**Sylacauga, Ala.**	**Feb. 28**
Mar. —.	**Smith's Grove, Ky**	**Jan. 7**
Apr. 1.	Reservoir, etc., Montrose, Colo., Adv. Mar. 11, 18.	Mar. 11
Apr. 1.	**Irrig., Usk, Wash**	Dec. 24
Apr. 3.	Pumping station, Canton, O.	Mar. 18
Apr. 3.	Pumping engine, Clarksville, Tenn., Adv. Mar. 18.	Mar. 18
Apr. 3.	Canal work, Cody, Wyo.	Mar. 11
Apr. 4.	Well, Poplarville, Miss. Adv. Mar. 18.	Mar. 18
Apr. 4.	Well, Lumberton, Miss. Adv. Mar. 18.	Mar. 18
Apr. 6.	Submarine pipe line, Boston, Mass.	Mar. 11
Apr. 10.	**Main supply canal, Belle Fourche, S. D.** Adv. Feb. 18 to Mar. 18.	**Feb. 18**
Apr. 10.	**Pipe & Spcls, Winnipeg, Man.** Adv. Feb. 18 to Mar. 11.	**Feb. 18**
Apr. 12.	Portage Le Prairie, Man.	Mar. 11
Apr. 15.	Alma, Neb.	Mar. 11
Apr. 18.	Pumping engine, Toronto, Ont., Adv. Mar. 11, 18.	Mar. 18
Apr. 18.	**New Orleans, La.** Adv. Feb. 11 to Mar. 18.	**Feb. 11**
Apr. 25.	Canal, pipe, etc., N. Orleans, La., Adv. Feb. 18 to Mar. 18.	Feb. 18
May. 1.	**Shirley, Ind.**	**Feb. 11**
May 14.	System, Mansfield, La. Adv. Mar. 4, 11.	Mar. 4
May 15.	Engine, etc., Montreal, Que. Adv. Mar. 11.	Mar. 11
———,	Mains, Oakes, N. Dak.	Mar. 11

SEWERAGE AND SEWAGE DISPOSAL.

Mar. 21.	Marion, Ind.	Mar. 18
Mar. 21.	Ashland, Ky.	Mar. 18
Mar. 21.	New York, N. Y.	Mar. 11
Mar. 21.	Des Moines, Ia.	Mar. 4
Mar. 21.	Trenton, N. J.	Mar. 18
Mar. 22.	Aberdeen, Miss. Adv. Mar. 11.	Mar. 11
Mar. 22.	Hoboken, N. J.	Mar. 11
Mar. 23.	Cleveland, O.	Mar. 18
Mar. 24.	Granite Falls, Minn.	Mar. 11
Mar. 25.	Seattle, Wash.	Mar. 18
Mar. 25.	Oakes, N. D.	Mar. 4
Mar. 28.	Atlantic City, N. J. Adv. Mar. 18.	Mar. 18
Mar. 28.	Dravosburg, Pa.	Mar. 18
Mar. 29.	Columbus, O., Adv. Mar. 18.	Mar. 18
Mar. 29.	Cincinnati, O.	Mar. 11
Mar. 29.	Neodesha, Kan., Adv. Mar. 11.	Mar. 11
Mar. 29.	Portsmouth, O.	Mar. 11
Mar. 29.	Ft. McIntosh, Tex.	Mar. 4
Mar. 31.	Minneapolis, Minn.	Mar. 18
Mar. 31.	Salem, Mass. (2 prop) Adv. Mar. 11, 18.	Mar. 11
Apr. 3.	Kirkwood, Mo.	Mar. 18
Apr. 3.	Richmond, Ind.	Mar. 18
Apr. 3.	Ft. Leavenworth, Kan. Adv. Mar. 11, 18.	Mar. 11
Apr. 5.	Logansport, Ind.	Mar. 11
Apr. 5.	St. Joseph, Mo. Adv. Mar. 11.	Mar. 11
Apr. 7.	Ft. Wood, N. Y. H., N. Y. Adv. Mar. 11, 18.	Mar. 11
Apr. 10.	Menominee, Mich. Adv. Mar. 18.	Mar. 18
Apr. 12.	Portage La Prairie, Man.	Mar. 11
Apr. 18.	**New Orleans, La.** Adv. Feb. 11 to Mar. 18.	**Feb. 18**
———,	Oakes, N. Dak.	Mar. 11

BRIDGES.

Mar. 22.	Alexandria, S. Dak.	Mar. 11
Mar. 22.	Greenvile, S. C.	Mar. 11
Mar. 23.	Chicago, Ill.	Mar. 18
Mar. 23.	Bloomsburg, Pa.	Mar. 11
Mar. 23.	Wilkesbarre, Pa.	Mar. 11
Mar. 23.	Washington, D. C. Adv. Feb. 25 to Mar. 18.	Feb. 25
Mar. 24.	Cedar Rapids, Ia.	Mar. 11
Mar. 25.	Winnipeg, Man.	Mar. 18
Mar. 25.	Bentonville, Ark.	Feb. 25
Mar. 28.	Louisa, Ky.	Mar. 18
Mar. 28.	Welland, Ont.	Mar. 11
Mar. 30.	Columbus, O.	Mar. 11
Mar. 30.	Providence, R. I. (2 prop.) Adv. Feb. 18 to Mar. 18.	Feb. 18
Mar. 30.	Manistee, Mich.	Feb. 25
Apr. 3.	Atlanta, Ga., Adv. Mar. 18.	Mar. 18
Apr. 4.	Columbus, Ga.	Mar. 4
Apr. 4.	Spokane, Wash.	Mar. 4
Apr. 4.	**Alma, Neb.**	**Feb. 18**
Apr. 4.	**Goldendale, Wash**	**Feb. 11**
Apr. 5.	Smithland, Ky.	Mar. 18
Apr. 5.	Birmingham, Ala.	Mar. 18
Apr. 5.	Indiinapolis, Ind.	Mar. 18
Apr. 5.	Langdon, N. Dak.	Mar. 11
Apr. 6.	Warrenton, Mo.	Mar. 18
Apr. 6.	Bluffton, Ind.	Mar. 18
Apr. 6.	Wabash, Ind.	Feb. 25
Apr. 19.	Moscow, Idaho.	Mar. 11
May 1.	Richland, Ark.	Mar. 11

PAVING AND ROADMAKING.

Mar. 20.	Wilkesbarre, Pa.	Mar. 18
Mar. 20.	Westfield, N. J.	Mar. 18
Mar. 20.	Albany, N. Y.	Mar. 18
Mar. 20.	Moline, Ill.	Mar. 18
Mar. 20.	South Orange, N. J. Adv. Mar. 11, 18.	Mar. 11
Mar. 20.	Clairton, Pa.	Mar. 4
Mar. 20.	Jacksonville, Fla.	Mar. 4
Mar. 21	Creston, Ia.	Mar. 18
Mar. 21.	New York, N. Y.	Mar. 11
Mar. 21.	St. Louis, Mo.	Mar. 11
Mar. 22.	Independence, Mo.	Mar. 11
Mar. 23.	Ft. Wayne, Ind.	Mar. 11
Mar. 23.	Ft. Leavenworth, Kan.	Mar. 11
Mar. 23.	Jerry City, O.	Mar. 4
Mar. 24.	New York, N. Y	Mar. 18
Mar. 24.	Omaha, Neb.	Mar. 18
Mar. 24.	Cincinnati, O.	Mar. 4
Mar. 25.	Boston, Mass.	Mar. 18
Mar. 25.	Seattle, Wash.	Mar. 18
Mar. 25.	Lancaster, Pa.	Mar. 4
Mar. 25.	Cincinnati, O.	Mar. 4
Mar. 27.	Long Island City, L. I., N. Y.	Mar. 18
Mar. 27.	Cincinnati, O.	Mar. 11
Mar. 27.	Tacoma, Wash.	Mar. 11
Mar. 28.	Atlantic City, N. J. Adv. Mar. 18.	Mar. 18
Mar. 28.	New Brighton, S. I., N. Y.	Mar. 18
Mar. 29.	Brooklyn, N. Y.	Mar. 18
Mar. 29.	Lima, O.	Mar. 11
Mar. 29.	Cincinnati, O.	Mar. 11
Mar. 30.	Brooklyn, N. Y.	Mar. 18
Mar. 31.	Detroit, Mich.	Mar. 11
Mar. —.	Tacoma, Wash.	Mar. 4
Apr. 1.	Norwood, O.	Mar. 11
Apr. 3.	Michigan City, Ind.	Mar. 18
Apr. 3.	Wilkesbarre, Pa.	Mar. 18
Apr. 4.	Greenville, Miss.	Mar. 18
Apr. 4.	Bloomfield, Ind.	Mar. 18
Apr. 3.	Montgomery, Ala.	Mar. 11
Apr. 5.	Peru, Ind.	Mar. 4
Apr. 10.	Ft. Mott, N. J., Adv. Mar. 18.	Mar. 18
Apr. 10.	Menominee, Mich. Adv. Mar. 18.	Mar. 18
Apr. 18.	La Crosse, Wis.	Feb. 25
May 1.	Parkridge, Ill.	Mar. 11

POWER, GAS AND ELECTRICITY.

Mar. 20.	Holyoke, Mass.	Mar. 11
Mar. 20.	**Washington, D. C.** **Adv. Feb. 11.**	**Feb. 11**
Mar. 21.	Washington, D. C.	Mar. 11
Mar. 21.	Norwalk, Ohio. Adv. Feb. 25 and Mar. 4.	Feb. 18
Mar. 22.	Aberdeen, Miss. Adv. Mar. 11.	Mar. 11
Mar. 23.	Dayton, O.	Mar. 4
Mar. 24.	Ft. Leavenworth, Kan.	Mar. 18
Mar. 24.	Chicago, Ill., Adv. Mar. 11.	Mar. 11
Mar. 25.	Portsmouth, N. H.	Feb. 25
Mar. 25.	Alpena, Mich. Adv. Mar. 4 to 18.	Mar. 4
Mar. 27.	New York, N. Y.	Mar. 18
Mar. 27.	Laconia, N. H.	Mar. 11
Mar. 27.	Santa Monica, Cal.	Mar. 4
Mar. 28.	New Albany, Miss. Adv. Mar. 18.	Mar. 18
Mar. 28.	Washington, D. C.	Mar. 18
Mar. 28.	Dover, N. J.	Mar. 4
Mar. 30.	Chickamauga Park, Ga. Adv. Mar. 11, 18.	Mar. 11
Mar. —.	Sylacauga, Ala.	Feb. 25
Apr. 1.	Portsmouth, N. H.	Mar. 11
Apr. 1.	Wernersville, Pa.	Mar. 11
Apr. 3.	Lakeport, Cal.	Mar. 4
Apr. 3.	**Cape Charles, Va.** Adv. Feb. 25.	**Feb. 25**
Apr. 11.	Shreveport, La.	Feb. 18
Apr. 12.	**Lockport, Ill.** **Adv. Feb. 18.**	**Feb. 18**
Apr. 15.	Alma, Neb.	Mar. 11
Apr. —.	**Ft. Valley, Ga.**	**Jan. 21**
May 1.	Empire, Colo.	Mar. 18
May 1.	**Shirley, Ind.**	**Feb. 11**
May 15.	Jewell City, Kan.	Mar. 18
———.	**Branchville, S. C.**	**Feb. 18**
———.	**Laconia, N. H.** **Adv. Jan. 28.**	**Jan. 28**

BUILDINGS.

Mar. 20.	Libraries, Waterloo, Ia.	Mar. 18
Mar. 20.	Y. M. C. A. Brandon, Man. Adv. Mar. 4, 11.	Mar. 4
Mar. 20.	Post Bldg., Chickamauga Park, Ga., Adv. Mar. 4 to 18.	Mar. 4
Mar. 20.	**P. O. Bldg., Elizabeth City, N. C., Adv. Feb. 4, 11**	**Feb. 4**
Mar. 21.	Bus. Bldg., Toronto Ont.	Mar. 18
Mar. 21.	School, Pittsburg, Pa.	Mar. 11
Mar. 21.	Plumbing Pub. Bldg., Albany, N. Y.	Mar. 11
Mar. 21.	Church, Clarkville, Ia.	Mar. 11
Mar. 21.	Hospital, New York, N. Y.	Feb. 28
Mar. 21.	**Armory, Rochester, N. Y.** **Adv. Feb. 18, 25.**	**Feb. 18**
Mar. 21.	**P. O. Bldg., Laredo, Tex.** **Adv. Feb. 4.**	**Feb. 4**
Mar. 22.	Plumbing School, Springfield, Mass.	Mar. 18
Mar. 22.	Pub. Bldg., Baltimore, Md.	Mar. 11
Mar. 22.	Pub. Bldg., Detroit, Mich.	Mar. 4
Mar. 23.	School, Worcester, Mass.	Mar. 18
Mar. 23.	School, Ansonia, Conn.	Mar. 18
Mar. 23.	School, West Allis, Wis.	Mar. 18
Mar. 23.	School, Selma, O.	Mar. 4
Mar. 23.	School, Baton Rouge, La.	Feb. 25
Mar. 23.	**P. O. Bldg., Sherman, Tex.** **Adv. Feb. 4, 11.**	**Feb. 4**
Mar. 24.	School, Marathon, Wis.	Mar. 11
Mar. 25.	Bus. Bldg., Winnipeg, Man	
Mar. 25.	School, Washington, D. C.	
Mar. 25.	Bus. Bldg., New Martinsvill W. Va.	
Mar. 25.	School, Norway, Ia.	
Mar. 25.	Church, Lincoln, Kan.	
Mar. 27.	School, New Brighton, S. I. N. Y.	
Mar. 27.	School, New York, N. Y.	
Mar. 27.	School, Boston, Mass.	
Mar. 27.	School, Brooklyn, N. Y.	
Mar. 27.	Htg. School, Columbus, O.	
Mar. 27.	School, Newark, O.	
Mar. 27.	School, Cleveland, O.	
Mar. 27.	Library, Attleborough, Mass.	
Mar. 27.	City Hall, Alpena, Mich.	
Mar. 27.	**P. O. Bldg., Lebanon, Pa.** **Adv. Feb. 11, 18.**	
Mar. 28.	School, Indianapolis, Ind.	
Mar. 28.	Library, Cincinnati, O.	
Mar. 28.	**P. O. Bldg, Superior, Wis.**	
Mar. 29.	Dormitory, New York, N. Y.	
Mar. 29.	Pub. Bldg. material, Washington, D. C., Adv. Mar. 18.	
Mar. 30.	Church, Hartford, Ind.	
Mar. 30.	Church, Clinton, Ia.	
Mar. 30.	Post Bldg., Ft. Riley, Kan. Adv. Mar. 11, 18.	
Mar. 30.	Bus. Bldg., Evansville, Ind	
Mar. 30.	Htg., P. P., Waterloo, Ia.	
Mar. 31.	Pub. Bldg., Ft. Greble, R. I.	
Mar. 31.	School, Peterboro, Ont.	
Mar. 31.	School, Cleveland Heights, O.	
Mar. —.	Theatre, Philadelphia, Pa.	
Mar.—.	**School, Klamath Falls, Ore.**	
Apr. 1.	Church, Champaign, Ill.	
Apr. 1.	Foundation for Pub. Bldg. Chicago, Ill.	
Apr. 1.	Elks Bldg., Los Angeles Cal.	
Apr. 1.	Court House, Corsicana, Tex.	
Apr. 1.	Schools, Curtice, O.	
Apr. 1.	Court House, Baraboo, Wis.	
Apr. 1.	**Y. M. C. A. plans, Binghamton, N. Y.**	
Apr. 3.	Hospital, Lincoln, Neb.	
Apr. 3.	School, Cleveland, O.	
Apr. 3.	Bus. Bldg., Cincinnati, O.	
Apr. 3.	School, Muncie, Ind.	
Apr. 3.	Court House, Kentland, Ind.	
Apr. 3.	P. O. Bldg., Macon, Ga.	
Apr. 3.	Court House, Newton, Ind.	
Apr. 4.	Police sta., N. Haven, Conn	
Apr. 4.	School, Hattiesburg, Miss.	
Apr. 5.	Hospital, Charleston, S. C.	
Apr. 5.	Post Bldgs., Ft. McKinley Me.	
Apr. 5.	**Court House plans, New Orleans, La.**	
Apr. 6.	Post Office, Marblehead, Mass. Adv. Mar. 4, 11.	
Apr. 10.	School, Ithaca, N. Y. Adv. Mar. 4 to 18.	
Apr. 12.	Jail, Oakland, Md.	
Apr. 12.	Court House, Marion, Va.	
Apr. 15.	Court House, Corsicana, Tex	
Apr. 15.	**Court House, Grundy, Va.**	
Apr. 17.	School, Richmond, Va.	
Apr. 18.	Pub. Bldg., St. Joseph, Mo.	
Apr. —.	School, New Haven, Conn.	
May 8.	Interior finish, U. S. Custom House, New York, N. Y., Adv. Mar. 11, 18	
May 9.	Mech. Equip. U. S. Custom House, New York, N. Y., Adv. Mar. 11, 18	
Jun. 15.	**Court House plans, New Orleans, La.**	

MISCELLANEOUS.

Mar. 20.	Gravel & sand, Boston, Mass.	
Mar. 20.	Garb. Disp., Perth Amboy N. J.	
Mar. 21.	Garb. disp., York, Pa.	
Mar. 21.	Ditches, Webster City, Ia.	
Mar. 21.	El.Ry. franchise, Los Angeles, Cal.	
Mar. 22.	Drainage work, Ft. Dodge, Ia.	
Mar. 23.	Screen doors, Panama	
Mar. 23.	St. Sprinkling, Plainfield, N. J.	
Mar. 24.	Garb. disp., Dayton, O.	
Mar. 24.	Cement, Panama	
Mar. 24.	El. Ry. franchise, Benicia, Cal.	
Mar. 25.	Elevator, Waco, Tex.	
Mar. 25.	Grading, etc., New Orleans La.	
Mar. 25.	Wharf, New Orleans, La.	
Mar. 26.	R. R. work, Atlanta, Ga.	
Mar. 27.	Pier, New York, N. Y.	
Mar. 27.	Trap Rock, etc., Long Island City, L. I., N. Y.	
Mar. 27.	Coal & Ash Handling Machinery, Washington, D. C., Adv. Mar. 18	
Mar. 27.	Riprap embankment, Ft. Strong, Mass.	
Mar. 28.	St. Sprinklers, Winnipeg, Man., Adv. Mar. 18	
Mar. 28.	Steel Shed, New Orleans, La.	
Mar. 28.	Drainage, Grant Park, Ill. Adv. Mar. 11.	
Mar. 29.	Screens, Ft. Mott, N. J. Adv. Mar. 11, 18.	
Mar. 30.	Coal conveying apparatus West Point, N. Y. Adv. Mar. 11, 18.	
Mar. 30.	Rock excav., Boston, Mass. Adv. Mar. 4 to 18.	
Mar. 31.	**El. Ry., Shanghai, China**	
Apr. 3.	Sanitary & Roughing material, Panama	
Apr. 4.	Cement, Winnipeg, Man. Adv. Mar. 11, 18.	
Apr. 4.	Ditch, Fairmont, Minn.	
Apr. 10.	**Channel work, Bermuda**	
Apr. 11.	**Supplies, Washington, D. C.**	
Apr. 11.	**Foundry equipment, Philadelphia, Pa.**	
Apr. 13.	Cement, Panama	
Apr. 14.	Cement, stone, etc., Ft. Revere, Mass., Adv. Mar. 18.	
Apr. 15.	R. R. work, Norfolk, Va. Adv. Mar. 11, 18.	
Apr. 15.	**Electric crane, Bremerton, Wash.**	
Apr. 25.	**Dredging, New Orleans, La.**	
Apr. 29.	**Coal handling plant, New Orleans, La.**	
May 6.	**Quay Wall, Bremerton, Wash.**	
May 10.	**Ditch, Stevens Point, Wis.**	
———,	Removg stone, Pensacola, Fla.	
———.	**R. R. ties, Atlanta, Ga.** **Adv. Mar. 4.**	

**Items marked thus give the names of parties awarded contracts.*